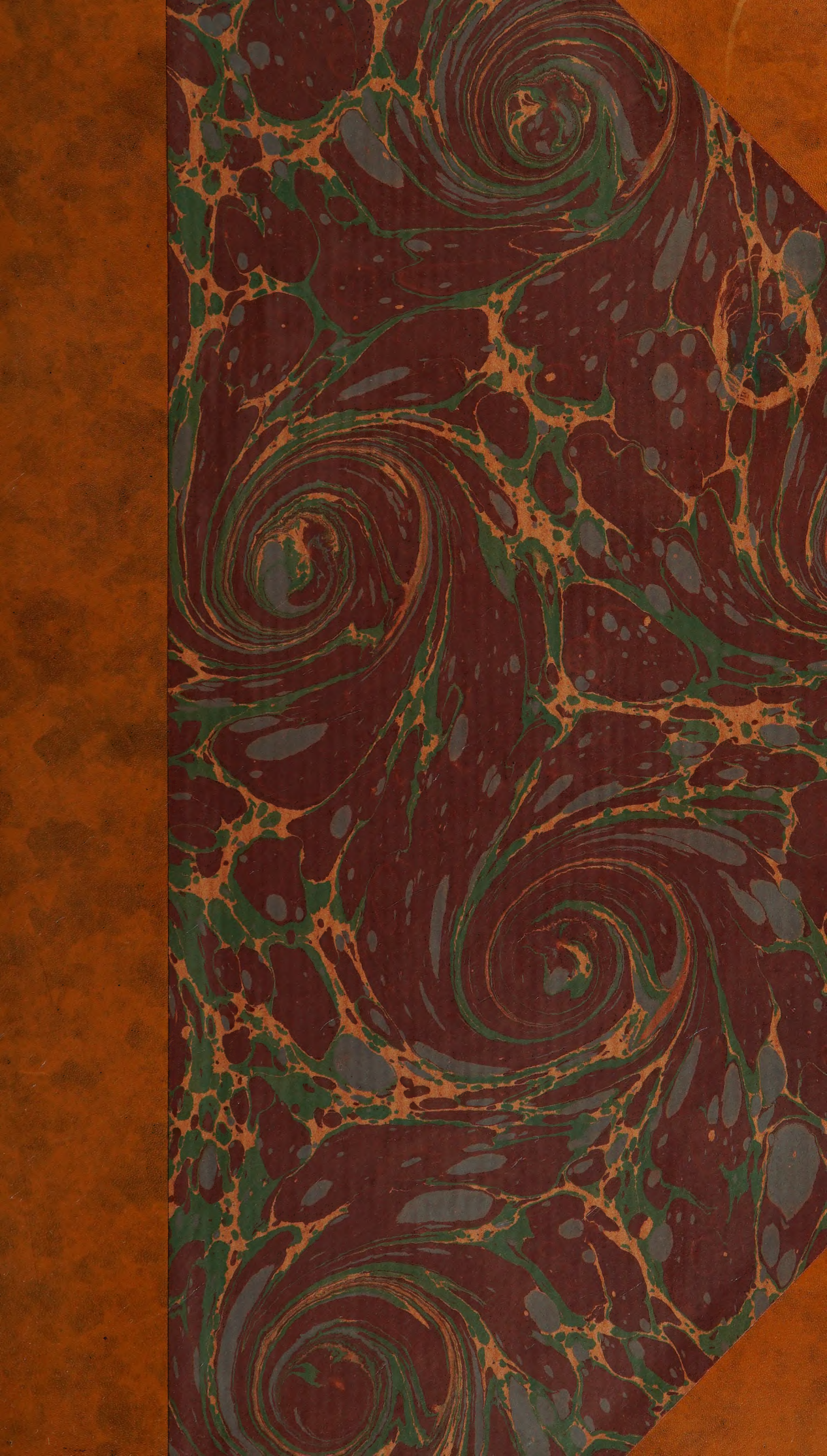

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# AN ESSAY ON BURNS,

PRINCIPALLY UPON THOSE

## WHICH HAPPPEN TO WORKMEN IN MINES

FROM THE

*Explosions of Inflammable Air, (or Hydrogen Gas.)*

CONTAINING A VIEW OF THE

## OPINIONS OF ANTIENT AND MODERN AUTHORS

UPON THE

## *SUBJECT OF BURNS;*

AND A VARIETY OF

## CASES CONDUCTED UPON DIFFERENT PRINCIPLES:

FROM WHICH

AN ATTEMPT IS MADE TO RESCUE THIS PART OF THE HEALING ART FROM EMPIRICISM, AND TO REDUCE IT TO THE LAWS OF THE ANIMAL ECONOMY.

By EDWARD KENTISH, Surgeon.

"The assignment of a multiplicity of causes, to account for particular "phenomena, always betokens a backward state of knowledge. The "business of science is to generalise facts, to class phenomena under "distinct heads, and shew their dependence upon a common principle "or cause. In the progress of human reason, polytheism has yielded to "the existence of one God; the intricate and seemingly opposite phe-"nomena of matter and motion have been referred to one general law "of gravitation; the puzzling and diversified appearances of electri-"city have been reduced to a few plain rules: the multitude of facts "concerning light and colours have been in like manner arranged into "a scientific form; and both the RAINBOW and the TELESCOPE bear "witness to the simplicity of optics."

S. L. Mitchell, M. D.

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(Doubtless ex-St George's as Henry Jeffreys was Surgeon there)
HJS 10/11/97

*ERRATA.*

Page 64, line 13, *for* this the uſe of, *read* the uſe of this.
70, line 3, *for* by cures, *read* by the relation of cures.
114, line 23, *for* increaſed, *read* cauſed.
121, line 19, *for* quantity, *read* quality.
176, line 3, *for* endured, *read* induced.

Henry Jeffreys Esq.
with best wishes
from his friend
the Author

# TO THE PROPRIETORS OF COLLIERIES UPON THE RIVER TYNE.

GENTLEMEN,

*IN ſending the following Eſſay into the world, I take the liberty of addreſſing it to you. There are two motives that induce me to do this: Firſt, That I may profit by this opportunity of thanking ſome of you for the favours which I have received, and which have enabled me to collect the following facts. Secondly, Becauſe you are the natural guardians of the health and comforts of an important claſs of workmen, for whoſe benefit it is particularly written. Enquiries into the diſeaſes which are peculiar to any claſs of workmen have ever been deemed objects of the firſt importance, inſomuch that many philoſophical ſocieties have offered premiums for ſuch productions; but, ſo far from any thing of this kind having taken place upon this ſubject, I am afraid the following remark will be found as true as it is* extraordinary, *That during a period exceeding ſix hundred years that the coal-trade has flouriſhed in this neighbourhood, not a ſingle remark upon the ſubject has been preſerved upon record, though during that period ſome of the firſt medical and ſurgical men in the kingdom have had the phenomena conſtantly before their eyes. What cauſes can be aſſigned for ſuch inattention to the intereſts of humanity? Ignorance and prejudice on the part of the people, and diſguſt on that of the faculty:*

*Theſe appear to me the principal cauſes why ſo little attention has been paid on the part of the practitioners. I need not point out to you, Gentlemen, that an ignorant old woman, or a* more *ignorant man, has frequently been enforced upon you, by the turbulent call of your people, againſt your better judgment: Can it be wondered at, when the beſt efforts of a man of ſenſibility are thus repelled, that diſguſt is too frequently the conſequence. I muſt confeſs I have felt it myſelf in the moment, but when I have thought of the greatneſs of the object, viz. that of acquiring the power of preſerving the lives of otherwiſe devoted individuals, on whoſe exertions perhaps families depended for their very exiſtence, the bare idea has ever increaſed my efforts, and made me return to the charge with redoubled energy. Should the diſpelling of this cloud of ignorance and prejudice from the minds of the people appear to you in the ſame light it does to me, I ſhould have little doubt of pointing out to your conſideration means that would tend to fix the treatment on ſuch ſure principles, as would procure the greateſt ſafety to your workmen, give the reſult of facts intereſting to ſociety at large, and be truly honourable and worthy ſuch patronage.*

*I have the honour to be,*

GENTLEMEN,

*Your obliged, obedient ſervant,*

E. KENTISH.

Newcaſtle upon Tyne, Feb. 2, 1797.

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ESSAY

# ESSAY ON BURNS, &c.

## INTRODUCTION.

### CHAP. I.

*Analyſis of Airs—Lavoiſier's Experiments—Phenomena of Combuſtion in general—Water—Decompoſition of it—Experiments—Production of Hydrogen Gas in Mines—Of Combuſtion in Mines in particular.*

IN an Eſſay, having for its more immediate object the treatment of a ſpecies of accident too frequently happening to workmen in coal-mines, it will not appear irrelevant to the ſubject to take a ſhort view of the phenomena attending the explo-ſion which occaſions it. And, as theſe exploſions in mines are altogether dependent upon the doctrines of pneumatic chemiſtry, it will be neceſſary to explain the nature of the different gaſſes by which they are produced. The atmoſphere, which formerly, under the denomination of the air, was ſuppoſed to be a ſimple element, has, by the indefatigable reſearches of modern chemiſts, been analyſed in ſo clear a manner as not to leave the ſha-

dow of a doubt of its being a compound maſs. It is capable of taking up various matters in ſolution; but its moſt common compoſition, or what may be called its healthy ſtate, conſiſts of two elaſtic fluids, the one highly conducive to all the purpoſes of life and of flame, and the other equally noxious to both. This is fully illuſtrated by the following experiment by M. Lavoiſier:—Having placed a certain quantity of pure mercury in a retort, adapted to a bell-glaſs which incloſed 100 cubic inches of common air, he kept up in his furnace a conſtant fire, of ſuch a force as to keep the mercury almoſt always at the boiling point. On the ſecond day, ſmall red particles began to appear upon the ſurface of the mercury, which gradually increaſed in ſize and number for four or five days. Convinced that the calcination of the mercury after that time did not go on, he extinguiſhed his fire, and when the veſſel was cool he found in his bell-glaſs, inſtead of 100 cubic inches of air, only 86—conſequently a loſs of 14 cubic inches of air. Fourteen inches of air weigh 7 grains, and the red particles of the calx of mercury being carefully collected, theſe had an increaſe of weight of 7 grains, the exact weight of air which ſeemed loſt. The 86 cubic inches of air, remaining in the glaſs after the calcination, were examined, and found to poſſeſs the following properties:—

An

An animal being put into it, was ſuffocated in a few minutes; and a taper plunged into it, was extinguiſhed as if it had been immerſed in water: This air has been differently denominated by chemiſts, but at preſent is generally known by the term *azotic gas*. M. Lavoiſier's ſecond experiment was to take the calx of mercury weighing 90 grains, the product of the laſt proceſs, and put it into a glaſs retort, fitted to a proper apparatus for receiving aerial products. Having applied a much ſtronger fire than in the laſt experiment, he obſerved that at firſt, in proportion as the calx of mercury became heated, the intenſity of its colour became augmented; but ſoon after the calx began gradually to decreaſe in bulk, and in a few minutes its red colour altogether diſappeared, and the calx was converted into running mercury, and 14 cubic inches of an aerial fluid paſſed over into the recipient. Theſe 14 cubic inches of air weighed 7 grains, the exact weight of the air conſumed by the calcination of the mercury in the firſt experiment, and the calx of mercury reduced to a metallic ſtate being examined, had loſt in weight 7 grains, the weight of the air obtained. This air poſſeſſed the following properties:—An animal being placed in it, became remarkably lively; a taper burnt in it with a dazzling ſplendour; and charcoal, inſtead of conſuming quietly away, as it does in common

air, burnt with a flame, attended with a decrepitating noiſe, and threw out ſuch a brilliant light that the eyes could ſcarcely endure it. This ſpecies of air was diſcovered nearly at the ſame time by ſeveral learned chemiſts, who denominated it differently according to their own ideas reſpecting ſome of its various properties; it was termed *vital air* by Lavoiſier; and from the great influence it has over the phenomena of life, when its uſes come to be known, it is likely to induce a greater revolution in medicine than any that has happened ſince the time of Hippocrates. At preſent it ſeems, by general conſent, to paſs under the name of *oxygen gas*.

Theſe are experiments by which M. Lavoiſier analyſed the atmoſphere; and it tends to give them an additional weight that, by repeating the experiments, and adding the products, viz. the 36 cubic inches of azotic gas, and the 14 cubic inches of oxygen gas, he ſynthetically recompoſed an elaſtic fluid ſimilar in all reſpects to the atmoſphere. The above experiments prove the compound nature of the atmoſphere, but do not give the exact proportions of each part; for the attraction of mercury to the baſe of oxygen gas, is not ſufficient to overcome all the circumſtances that oppoſe its union. Theſe obſtacles are the mutual adheſion of the two conſtituent parts of the atmoſphere.

phere to each other, and the elective attraction which unites the base of oxygen gas with caloric; in consequence of these, when the calcination ends, there is still a portion of oxygen gas united to the azotic gas, which the mercury cannot separate. But from repeated and varied experiments, which it would be tedious and useless to relate, M. Lavoisier concludes, that the common proportions of the atmosphere in our climate are 27 parts of oxygen gas, and 73 azotic gas.

We have thus related the experiments by which the atmosphere is demonstrated to be a compound fluid consisting of oxygen and azotic gasses; and it will now be necessary to proceed to shew that these gasses themselves are other compound bodies, viz. that they are compounded of oxygen and azote, with a sufficient quantity of heat to hold them in the gaseous form.

The following experiment proves the above:— A glass jar full of pure oxygen gas being inverted over mercury, a fine piece of iron wire heated red hot at its extremity plunged into it burns with an astonishing brilliancy, giving out large sparks similar to those in Chinese fire-works, and falling to the bottom in round globules. At the beginning of the combustion there is a slight augmentation in the volume of air in the jar, caused by the dilatation of heat; but presently after a rapid diminu-

tion takes place, and the mercury rises in the glass, insomuch that when the iron is sufficient, and the oxygen gas operated upon perfectly pure, the whole gas employed is absorbed. The theory of this experiment is the same as the former. At a certain temperature iron has a greater affinity for oxygen, than caloric and light have. Iron therefore attracts to itself the oxygen of the gas; and the heat and light which kept it in a gaseous form becoming disengaged from the union they held with the oxygen, are rendered active, and evident to the senses, with an avidity to combine with the first medium that presents. In the former experiment of the calcination of the mercury, which lasted for some days, the disengagement of heat and light was in so small a proportion during each individual moment of time, as to be imperceptible to the organs of vision, though there can be no doubt from the result, of the same having taken place in both experiments. In fact, in all combustion the heat and flame do not arise solely from the coals we use, nor from the tallow or wax of our candles, but these are only *means* to furnish us with small portions of hydrogen gas, (hereafter to be described) which combine with the oxygen gas of the atmosphere by means of flame, which is a conducting medium to the union of the gasses, and continues as long as the combination

nation goes on; if a ſmall quantity is ſupplied, the pleaſing effects of a candle or fire are produced; if a large quantity, the terrible effects which we ſhall preſently mention. An old pit at Whitehaven, furniſhing a quantity of hydrogen gas, was ſet fire to, and continued to burn for a length of time, and giving a great light at night, ſuggeſted the poſſibility of conveying the air in ſmall pipes to different parts of the town, and firing them during the night, to make them anſwer the purpoſe of lamps for the convenience of the inhabitants.—The care of man is only neceſſary to find the hydrogen gas in the quantity he wants it—the oxygen for the purpoſes of combuſtion, abounds in the atmoſphere nearly in the proportions as before mentioned, of 27 to 73 parts azotic gas. When theſe proportions are much changed, the effects vary according to the change; whether towards the greater quantity of azotic gas which diminiſhes all theſe phenomena of combuſtion, or to an increaſe of oxygen gas which augments them. Theſe different experiments and views of the new gaſſes (or airs) will appear ſufficient to ſhew the compound nature of the atmoſphere.

It will appear that *water* is not that ſimple element which the ancients ſuppoſed. As the phenomenon we wiſh to explain depends chiefly upon the decompo-

ſition of that fluid, it will be proper to relate the following experiment made by Monſ. Meuſnier, in which water was decompoſed. He took a gun barrel, into which he put ſome pieces of iron wire flattened by a hammer. He weighed the whole with a ſcrupulous exactneſs. He then luted the gun barrel to ſecure it from the immediate contact of the fire. It was then placed in a furnace, but ſo inclined that water would eaſily run down it. He adapted to the upper extremity a funnel containing water, from which it could not eſcape into the gun barrel but drop by drop. This funnel was cloſed at the top, to avoid the leaſt evaporation of water. At the lower extremity veſſels were adapted to receive any aerial product. To uſe every precaution, theſe were exhauſted of their air :—The gun barrel was now rendered red hot, and the water paſſed into the funnel drop by drop. An aſtoniſhing quantity of hydrogen gas (or inflammable air) was quickly obtained. Having removed the luting, the gun barrel with its contents weighed heavier than before; and the acquired weight of the gun barrel being added to the weight of the hydrogen gas thus produced, was preciſely the weight of the water expended in the proceſs; and the iron wire found in the barrel after the proceſs was over, reſembled in every reſpect iron that had been conſumed in oxygen gas, that

that is, it had become an oxyd of iron. In this experiment the oxygen of the water combines with the iron, which it renders a calx or oxyd; whilſt the hydrogen of the water combining with the heat and light from the furnace, eſcapes into the receiver under the form of hydrogen gas, or inflammable air.*

Water has not only been thus decompoſed, but the truth of the doctrine was ſtill further proved by ſyntheſis, or the compoſition of water by the combuſtion of hydrogen and oxygen gaſſes by Meſſrs Meuſnier and Lavoiſier, under the inſpection of the academy of ſciences at Paris.

Having related ſome of the moſt ſtriking facts which tend to prove the compound nature of the common atmoſphere and of water, we need proceed no further to prove that they will follow the laws of other compound bodies, and be decompoſed whenever they meet with ſubſtances having a greater affinity to any of their component parts than

* This experiment is now performed with much greater facility by the aſſiſtance of the convenient apparatus invented by Mr Watt to aſſiſt Dr Beddoes' laudable undertaking of adminiſtering various factitious gaſſes as medicine; which, though not yet generally adopted, appears in ſeveral inſtances to be highly advantageous, particularly in a caſe of paralyſis, which the gentlemen of the faculty at Newcaſtle had an opportunity of ſeeing, in a patient at the Baths.

than they have to each other. Thus it is eaſy to conceive how hydrogen gas (or inflammable air) is generated in coal pits; for the water filtrating through the different ſtrata of the earth may be decompoſed when in contact with pyrites, metals, or coal itſelf, and collected in old pits, or in any part of pits through which a conſtant and briſk current of freſh atmoſphere, which would carry off the hydrogen gas as it generates, is not made to paſs. Sometimes it happens that they perforate with ſome of their working tools a barrier which ſeparated them from what they term a waſte, or a part from which the coal had been formerly taken. But by whatever means the collection is admitted, the effects are the ſame. If *not* allowed to combine with the oxygen of the atmoſphere, they mix without exploding; but if a combining medium is at hand, ſuch as the electric ſpark, but moſt frequently the flame of a candle, the rapidity of the combination produces effects moſt deplorable; the heat and light under the appearance of a moſt vivid flame, form a medium of diſengaged fire, which violently tends to combine itſelf with every thing it comes in contact with; ſometimes the very horſes as well as the miners in the pit are ſcorched to death, and die in the moſt cruel torments. Can there in imagination be any thing more horrible than to be thus engulphed in pure elemental fire!

And

And to add to the horror, when the collection of hydrogen gas is large, the immenſe vacuum that is cauſed by the ſudden formation of water diſturbs the equilibrium of the atmoſphere, and cauſes ſuch guſts of wind down one ſhaft and ſometimes up another to ſuch a degree, as nearly to reſemble a piece of ordnance. In fact, the materials of both phenomena are the ſame, only the order is inverted. In the one inſtance there is a ſudden formation of elaſtic fluids; in the other a ſudden condenſation of the ſame ſpecies of elaſtic fluids, viz. hydrogen and oxygen gaſſes; in the one inſtance, the atmoſphere ſupplies oxygen, and the mine hydrogen; the flame, or electric ſpark, is the flint; in the other the nitre ſupplies the oxygen gas, and the ſulphur and charcoal the hydrogen gas, while the ſteel and flint give fire to looſen them from their bonds, and enable them to exerciſe their deſtructive power. Theſe phenomena are beautifully illuſtrated by paſſing an electric ſpark through a glaſs tube, filled with a mixture of oxygen and hydrogen gaſſes.

CHAP.

## CHAP. II.

*Ancient, Heiſter—Commentaries by Van Swieten.—Modern, Bell—Encyclopedie Methodique—Med. Eclairée—Practice and Opinions of Authors and Practitioners in this Iſland.*

IN ſhewing the contradictory *opinions* of phyſicians and ſurgeons, ancient and modern, on the treatment of burns, nothing can tend to give us a clearer idea of the imperfection of our knowledge than to collect *thoſe* maintained by the moſt enlightened medical characters. As every ſucceeding inveſtigator has a right to canvaſs the opinions of his predeceſſors, I ſhall profit of this right, not to cavil at them, but merely to ſhew that when phyſicians and ſurgeons, who have ſeen ſome laws of the animal œconomy more clearly than their brethren, are not content with marking their information, or giving the ſimple fact to poſterity, but are eager to overturn the uſually received, and give us a *new*, ſyſtem, a great many errors creep into their works. Theſe a future age finds out, and perhaps may throw away the good with the bad; ſo that inſtead of our art being progreſſive, as the marking the laws of the animal œconomy, and ſtating the different facts as they

they happened, would make it, we ſometimes are obliged to throw away real knowledge, when jumbled with hypothetical chimæras. As a proof of this, which I fear may be called a raſh aſſertion, I beg leave to make ſome quotations from the works of authors of the firſt reſpectability, who, in medicine and ſurgery may be termed both ancient and modern. Heiſter, in his Elements of Surgery, ſays, * "Burns may not improperly be divided into four claſſes or degrees; the firſt and leaſt appears to be, when the part affected feels pain, attended with redneſs and heat, and after a ſhort time ſhows a riſing bliſter.—The ſecond is when bliſters riſe with great pain immediately after the burn.—The third, when the ſkin, and the fat, and fleſh under it, are ſo much burnt as immediately to exhibit a ſcab.—The fourth and laſt is, when the burn has been ſo violent as to have deſtroyed every thing to the bone. The third degree reſembles gangrene;—

* Enimvero *quatuor admodum combuſtionis gradus* conſtitui haud inepte poterunt. *Primus* quidem atque minimus ille nobis videtur, quando membrum corporis aduſtum cum rubore atque calore dolet, puſtulamque ſupereminentem, poſt elapſum breve aliquod temporis ſpatium, oſtendit. *Alter* gradus is eſt, quando ſtatim ab ambuſtione puſtulæ cum inſigni dolore prorumpunt. *Tertius*, quando cutis eidemque ſubjecta pinguedo ac caro ſic aduruntur, ut cruſtam ſtatim referant. *Quartus* denique is dicitur, ubi

gangrene;—the fourth ſphacelus: Whence it is further evident that burns very nearly reſemble inflammations, and that each degree of them is marked by nearly the ſame indications.

"The reſemblance of burns to inflammations is ſhewn not only in the degrees, but in the methods of cure; for in caſes of the ſlight or firſt degree, reſolvent applications are by far the beſt, ſuch as we have directed in caſes of inflammation, (C. II. No. 9 and ſeq.) of which two kinds are chiefly to be preferred, aſtringents and emollients. Among the gentle aſtringents, common ſpirit, or rectified, or even camphorated ſpirit of wine, may be reckoned, provided the injured parts be dipped into it, or be carefully bathed with rags moiſtened

ubi ita vehemens ambuſtio contigit, ut nihil fere non ad ipſum uſque os perierit. *Tertius* gradus gangrænæ, quartus autem ſphacelo non abſimiles videntur. Unde ſimul iſtud liquet; nempe ambuſtiones quam proxime ad inflammationum ſimilitudinem accedere, iiſdemque propemodum ſignis unumquemvis ipſarum gradum dignoſci.

II. Quemadmodum autem in gradibus, ſic in ipſis quoque curandi viis haud abſimilis inflammationi combuſtio deprehenditur. Quoties enim levior ſeu *primi gradus* ambuſtio contigit, longe optima ſunt medicamenta reſolventia, qualia quidem in phlegmone propoſuimus. (Capt. II. No. ix. ſeq.) Quorum bina potiſſimum genera ſunt: *Adſtringentium* videlicet atque *emollientium*. Leniter autem adſtringunt *ſpiritus vini*, vel *vulgaris* bonæ notæ, vel *recti-*

ed in the ſpirit. Nearly the ſame effect is produced by litharge diſſolved in vinegar, (Goulard's extract) the liquor of pickled cabbage, (ſour crout) or a decoction of oxycrate (vinegar and water and ſometimes a little honey) with ſalt applied hot, and as frequently as poſſible, in the ſame manner as the ſpirits before recommended. Oil of turpentine alſo is uſually of advantage, if it be early applied. Laſtly, it is not improper immediately to expoſe the burnt part of the body, as a finger or a hand, to the candle or to a fire, and to hold it ſo expoſed as near and as long as the pain will allow, or to bring it near and to remove it alternately, till the ſenſation of heat and pain is abated.— For thus not only the ſtagnated blood is, by the vehe-

*rectificatus*, vel et *camphoratus*; ſiquidem pars læſa *immittitur*, vel et per linimenta *ſpiritu* illo *madentia diligentiſſime fovetur*. Ejuſdem fere uſus hic ſunt *acetum lythargyriſatum*, *muria braſſicæ conditæ*, vel et *oxycratum* cum *ſale* decoctum *calidumque*, perinde ut ſpiritus modo laudati, quam ſæpiſſime ſuperimpoſitum. Expeditum quoque hic eſſe ſolet *terebinthinæ oleum*; ſiquidem opportune ac ſæpius corpori illinatur. Denique haud alienum hic eſt, partem corporis aduſtum, ut digitum, vel manum *candelæ* protinus vel *igni* objicere, eandemque, quam proxime diutiſſimeque quam propter dolores fieri poteſt, ita continere, vel et alternis nunc removere, nunc denuo admovere, donec et *caloris*, et *doloris ſenſus* ſeſe remittant. Sic enim non ſanguis tantum ſtagnans, per ipſam ignis vehementiam, in priſtinum ordinem redigitur, ſed puſtulæ quoque una cum ſymtomatibus aliis quam aptiſſimè præcaventur; atque ita primus ambuſtionis gradus haud difficulter

ut

vehemence of the fire alone, reduced to its former ſtate, but bliſters alſo, with the other ſevere ſymptoms, are moſt effectually prevented, and the firſt degree of burn is often without difficulty cured. An almoſt oppoſite, but equally effectual, method of cure is that which has recourſe to emollient medicines; by theſe, whatever is contracted and wrinkled up in the fibres and ſmall veſſels, is ſoftened, the natural paſſage and circulation of the blood through them is reſtored, and thus the fatal conſequences which might have been apprehended are obviated. Water moderately heated as the part affected will bear it is of conſiderable uſe, if a folded linen cloth dipped in it be applied to the burnt part, and the moiſture be added through it every now and then, till the ſenſe of heat and pain is by degrees abated. But 2dly, This

ut plurimum curatur. Idque magis etiam, ſi commendata ſuperius medicamenta ſimul adhibentur.

III. *Huic fere contraria, ſed æque tamen apta illa curatio eſt,* quæ *ab emollientibus medicamentis ſua petit* præſidia. Hic enim quicquid in fibris, ac venulis adſtrictum et corrugatum fuerat, emollitur, naturaliſque proin ſanguini per eaſdem tranſitus atque circuitus, propulſis, quæ accidere poterant, malis gravioribus, reſtituitur. Haud exigui uſus hic eſt 1) aqua modice calida, ipſius que membri afflicti ſenſui accommodata; ſiquidem tinctum in ipſa linimentum complicatum ſuper partem aduſtam imponitur, ſubindeque denuo per eandem humectatur, dum ignis ac doloris ſenſus paullatim evaneſcat. Sed 2) valentior tamen ad ambuſtionem leniendam *iſtiuſmodi aqua calida* eſſe ſolet, ex qua vel althæa, vel malva,

This hot water is more effectual if marſhmallow, mallow, mullein, linſeed, ſeeds of fenugreek or quince, or other ſimilar emollients, have been boiled in it. 3dly, Emollient cataplaſms made either of the herbs above recommended, or of any other obvious poultice, and applied as hot as they can be borne, are found of great advantage; for ſcarcely any poultice can be found which does not poſſeſs ſome emollient quality. 4thly, Emollient oils, as of bruiſed ſweet almonds, olives, white lilies, hen-bane, or others, are valuable in this way: Theſe are applied either upon linen cloths, or often with a feather, applying them frequently ſo that the part may not get dry. 5thly, Mynſichtus's burn-ointment muſt not be omitted, which is an excellent lenitive; it is made of olive



malva, vel verbaſcum, ſemina lini, fœnum græcum, mali cydonii ſemina, iiſdemque non abſimilia medicamenta emollientia alia decocta ſunt. Deinde 3) commodiſſima quoque hic ea *cataplaſmata emollientia* reperiuntur, quæ vel ex jamjam laudatis herbis fiunt vel etiam ex quacunque demum alia *pulticula* obvia conficiuntur, calidiſſimaque, quantum licet, crebro ſupradantur. Fere nulla enim inveniri pulticula unquam potuit, quin aliaquam ſaltem emolliendi vim obtineat. Tum 4) ſatis quoque nobilia ad emolliendam ſunt *olea emollientia*, lini puta, amygdalarum dulcium, olivarum, liliorum alborum, hyoſcyami, et ſi quæ alia ſunt hujuſmodi. Hæc ipſa linamentorum adminiculo ſupradantur, vel plumulæ inſtrumento frequenter, antequam ficceſcant, illinuntur.

Denique

or linſeed oil, mixed with the white of egg, and applied in the uſual way. The mucilage of quince (ſeeds) is of remarkable efficacy; but of the above-mentioned applications it muſt be obſerved in general, that they are of little or no uſe unleſs they be frequently repeated.

" When this ſecond degree is a little more violent and affects a great part of the body, it ſeems neceſſary, in order to guard againſt exulceration, ugly ſcars, or even gangrene, to *take blood* in proportion to the degree of the burn; in ſome caſes *even to fainting;* and afterwards to preſcribe ſtrong purging medicines. The external applications muſt be the ſame as before.

" In

Denique 5) nec omittendum hic illud Mynſichti *unguentum ad ambuſtiones*, quod egregium leniens eſt, quodque ex olivarum aut lini oleo cum albumine ovi mixto conficitur, eodemque ut cetera modo ſuperimponitur. Quanquam *mali cydonii mucilago* inſigniter quoque hic proficiat. Ceterum de præceptis hactenus medicamentis breviter hic tenendum illud eſt; parum ſcilicet atque adeo nihil eadem efficere, niſi ſœpius iterentur.

Quoties *paullo vehementior ambuſtionis ſecundus ille gradus* incidit, ingentemque corporis partem occupat, neceſſarium utique ad exulcerationem, cicatrices deformes, ipſamque adeo gangrænam præcavendum videtur eſſe, ſanguinem protinus, pro ambuſtiones modo, *vel ad animi defectionem* uſque detrahere, deinceps autum vehementius aliquod medicamentum purgans, cujuſmodi ſupra in contuſione præſcripſimus (Lib. I. Cap. xv. No. 13.) Cetera enim extrinſecus eadem facienda ſunt, ut jamjam propoſuimus.

" In infants, for whom bleeding is leſs proper, a revulſion muſt be procured by repeated purgings; for the reſt, as in other ſevere wounds and inflammations, great attention ought to be paid to the diet; the thinneſt drinks and ptiſans ought to be uſed; for every thing which is heating or taken immoderately, is uſually fatal, by increaſing the heat and pain; but nothing is more efficacious in cooling the heat of burns than the directions of the famous Sir Kenelm Digby, to give ten or twelve drops of ſpirit of ſalt every now and then, either by itſelf or dropped into other drinks."

Heiſter ſeems evidently, from his obſervations, to lean very decidedly to the uſe of aſtringents: the uſe of ſpirits externally, of oil, of turpentine, of hot water, and of applying the part to a candle or fire, will come more readily under the denomination of *ſtimulants*. But what can we ſuppoſe when this very man, with all his acuteneſs, recom-

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ſuimus. In infantibus autem quia minus apta ſanguinis miſſio videtur, revellendi cauſa iteranda potius alvi expurgatio eſt. Decetero ut in vulnerationibus atque inflammationibus gravioribus reliquis, ſic in ambuſtionibus quoque ſolertiſſimam victus rationem obſervare convenit. Igitur *imprimis* adhibenda hic ſunt *potiones*, ac *ſorbitiones* quam maxime *tenues*. Quicquid enim aut ex *caleficientibus*, aut intemperanter aſſumitur, quia *calorem*, ac *dolores* adauget, *peſtilentiſſimum eſſe conſuevit*. Sed nihil tamen ad calorem ambuſtionibus ortum attemperandum valentius quicquam celeberrimo Dygbæo viſum legimus, quam ſalis quidem ſpiritum ad x vel xv guttulas identidem ægro vel ſeorſim ingeſtum, vel potionibus inſtillatum.—*Heiſteri Inſt. Chirurg. tom.* 1, *p.* 330–333.

mends remedies of a directly oppoſite tendency, viz. his emollients, his linſeed, his almond, and his olive oils;—can we heſitate in ſaying he had not had an opportunity of properly appreciating the merits of the different methods he recommends?—for I have too great a reſpect for the heart of ſo enlightened a head as to ſuppoſe he would either wiſh to lead into error or record an untruth. It falls to the lot of few men to appreciate properly the effect of various modes of treatment in a particular diſeaſe; for if a patient recovers, whatever was the treatment, whether good or bad, we flatter ourſelves it was the effect of our ſuperior merit in conducting the diſeaſe; but future experience may convince us that the recovery, of which we ſo vainly boaſted, was a victory of Nature over the mal-practice of art.

The external means he recommends we thus ſee are various and oppoſite; the internal are more in uniſon,—bleed and keep all low, and in young ſubjects purge: But I ſhall ceaſe for the preſent, as we have the contradictory opinions of other authors to look at. I need not make any further apology for theſe remarks, or for the quotations from other authors, as the opinions I ſhall bring forward, from their works, are the ground-work upon which I am induced to offer my ideas upon the ſubject; for feeling as I have done the pain

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ariſing from my own ignorance, and the little benefit I have received from any of the authors whom I have conſulted upon the ſubject, I hope that by thus candidly ſtating the ſtruggle I have had through chaos, my difficulties may ſerve as a guide for future practitioners to avoid the ſame rocks.

Let us now ſee what Van Swieten, in his Commentaries on Boerhaave's Aphoriſms, ſays on the ſubject of Burns :—

*Sect.* CCCLXXVI.—*If actual fire, or any thing which conceals fire, is applied to our bodies, there follows a deſtruction of the ſmall veſſels in the part, and an extravaſation of their humours, varying according to the difference and duration of the cauſe, and the nature of the affected part.*

" *Nature of the affected part.*—But the different nature and action, or uſe of the affected part, will again make a difference in the effects of fire: Thoſe ſmiths who are daily employed in the making of anchors, have the palms of their hands extremely hard and inſenſible like horn, inſomuch that they are capable of holding burning coals, or even hot iron from the furnace, without danger; but the ſame ſmiths, when they lie ſleeping by the fire ſide, after they have been tired by their day's labour, have the ſkin of their legs often burnt, and raiſed into a bliſter, by a ſmall particle of ſuch fire. When a citizen of the Hague was blowing with

his mouth into a muſket, the piece being charged, unfortunately took fire, the man not knowing that it was loaded; and by this accident his palate, gula, gums, and tongue were miſerably burnt, inſomuch that he was not able to ſwallow any thing for the ſpace of eighteen days; though bleeding and other ſelect remedies were uſed, and the dead parts ſeparated from the living; which being extremely painful and ſore, created much miſery to the patient, till at length ſome fragments of bones being ſeparated from the palate, he did well, and gained the better of death after a hard ſtruggle*. But it is very evident that a burn would be much leſs dangerous and troubleſome, provided the hand was to be burnt with gun-powder, inſtead of the mouth and gula.

" *Sect.* CCCCLXXVII.—*The different degrees of theſe ſeveral effects from burning, reſemble thoſe obſerved from the firſt and ſlighteſt degree of an inflammation, till it degenerates into the worſt or moſt ſevere ſphacelus.*

" *Sect.* CCCCLXXVIII.—*Hence the phenomena or ſymptoms, the diagnoſis and the prognoſis are the ſame in both.*

" *Sect.* CCCCLXXIX.—*But in the cure alſo there is no difference; and more eſpecially the* antiphlogiſtic drinks, *proper for inflammations, are* always *neceſſary in burns.*

* Stalpart. Vander Wielen Obſervat. rar. Cent. Ob 24.

"For in the ſame manner as no general method can be preſcribed for the cure of inflammation, but the means are to be varied according as it tends either to a reſolution, a ſuppuration, a gangrene, or a ſcirrhus; ſo alſo in burns, a very different method of treatment is required, when it ſtops within the limits of a reſolvable inflammation, than when the fire has deſtroyed, or converted the part into gangrenous or dead eſcars. In the following aphoriſms we ſhall therefore preſcribe the method of cure proper to each degree of burning, by which it will appear, that this diſorder correſponds very much to the curative indications enumerated in the hiſtory of phlegmons; inſomuch that there is but *one* remedy that can be univerſally recommended in all the ſpecies of burns, namely, the uſe of a *thin antiphlogiſtic*, or *cooling drink*. For there is a degree of inflammation, which accompanies even a ſlight burn. But in the more intenſe burns, eſpecially if a large part of the body has been injured, *all theſe remedies will be convenient*, which we recommended before for the cure of a *violent phlegmon*, and more eſpecially *bleeding*, repeated according to the nature of the caſe, with *antiphlogiſtic purges*, will be *of the greateſt uſe*. By theſe means Hildanus* happily cured the



* De Combuſt. cap. 7, pag. 922.

ſervant of a dyer that fell into a copper full of hot dye, which was not yet ſcalding, and by the external application of the beſt topical remedies, he cured this ſlight ſcalding of the whole body; which yet appears from the hiſtory not to have exceeded the limits of a reſolvable inflammation, except in a few parts of the body, which touched the oak chips and other hard materials *lying* next to the bottom of the copper; to which parts a different method of treatment was uſed, as Hildanus informs us. At leaſt it is evident from this inſtance, how ſerviceable thoſe means may be for the cure of burns, which were recommended before for the cure of a reſolvable inflammation.

" *Sect.* CCCCLXXX.—*Burning or ſcalding, within the limits of a reſolvable inflammation, is to be treated with ſuch remedies as preſerve, or as it were pickle the juices and put them into motion, and by ſuch things as open and preſerve the veſſels; and this is performed by the application of a moderate degree of fire, by fomentations and cataplaſms, by* waſhed butter, *or laſtly, with* ſpirit of wine and a little vitriol.

" If a burn has injured a ſmall part of the body, there will be no neceſſity to diſturb the whole by bleeding and cooling purges, &c. for in that caſe it may be ſufficient to treat the part itſelf affected with topical remedies. When the burning has been ſo ſlight as only to cauſe a reſolvable inflammation

mation in the part, the cure is then eaſy enough, even by moſt of the different remedies which are kept in families for that purpoſe. But what ſeems not a little ſurpriſing is, that even the beſt ſurgeons ſhould recommend medicines of oppoſite virtues in theſe accidents, namely, emollients and aſtringents, attractives and repellents, &c. &c. Thus Parey* recommends the juices of houſe-leek, lettuce, plantain, &c. mixed up with the white of an egg; and in the ſame place, and for the ſame diſorder, a mixture of clay and vinegar, or writing ink mixed with oxycrate, or *roach* allum diſſolved in water; and obſerves, that the acrid bulbous roots of onions, beat to a cataplaſm, with a little ſalt, are applied with very good ſucceſs. I have alſo obſerved ſeveral other things applied in theſe caſes, to the great relief of the diſorder, provided the application of them is frequently repeated. And this is a caution given almoſt by all ſurgeons, that at the beginning the remedies applied to the burnt part ought to be frequently renewed until the pain is abated, or as Parey expreſſes it, till the heat or fire of the part has been drawn out. When the wife of Hildanus had ſeveral times dipped her hand, up to the wriſt, inadvertently into boiling ſoap, immediately after a violent pain followed,

* Livre xii. chap. 17, 18.—page 300.

lowed, not only in the hand, but alſo throughout the whole arm; but immediately after the ſoap was waſhed off with warm water, and then the injured part was anointed with a liniment made up of raw onions, ſalt, ſoap, oil of ſweet almonds and of roſes mixed together; the arm was alſo anointed with oil of roſes, and the affected parts inveſted with a bandage dipped in vinegar and water; and he adds, that he often repeated theſe means with good ſucceſs; that no ulceration of the ſkin followed ſo violent a ſcald, except a ſmall puſtule in the thumb, and another in the fore-finger, which yet were eaſily cured, only with a little unguentum baſilicon*. In another caſe, he ſays he renewed emplaſters four times every hour for the firſt day, and by that means drew out the greateſt part of the fire. Thus therefore there ſeem to be many remedies capable of curing this degree of burning, provided they are ſuch as keep the ſtagnating humours from corrupting, and put them into motion, while at the ſame time they preſerve the continuity of the veſſels, and render them pervious. It may be aſked, whether fire applied to any part of the human body, does not remain united to it for a time? and whether it may not be *extracted* by *attractive remedies* in the *ſame* manner *as the freezing*

* Livre xii. chap. 17, 18.

*ing ſpiculæ* are drawn out of *frozen bodies* by the *application* of *ſnow* and *cold water?* At leaſt it is certain that, barely *by a prudent application of fire, the pain is abated in the burnt part*, and *at length totally removed.* Hence Fernelius* has very well pronounced, that fire itſelf, applied near to the burnt part, is its own antidote to drive out the fire of the burnt part, by which the pain is abated; and he adds, that ſome remedies applied to the parts, entice out the fire. Thus he ſays, that the leaves of leeks and arum, or wake robin, make a preſent remedy for a burn; and ſoon after he adds a numerous catalogue of medicines which ſerve to the ſame intention, though their medicinal virtues are very different from each other. I have frequently ſeen that the mere application of warm water, or anointing with unguentum populeum or the like, has relieved the pain in the burnt part; and when the pain has encreaſed again in a little time afterwards, it has been a ſecond time removed by the application of linen cloths moiſtened with warm water, or by renewing the unction with the ſame liniment; and thus, by the repeated application of the ſame remedies, all the pains have by degrees vaniſhed.

"But ſpirit of wine, we are aſſured by Sydenham,† is

* Therapeut. lib. vi. cap. 20.

† De Peripneumonia Notha in fini, pag. 343.

is preferable to any other remedy as yet known; namely, if linen rags are dipped and applied to the burnt parts, and the application of them repeated till the pain excited by the fire is entirely removed; and afterwards the ſame application he would have repeated only twice in a day. It is to be here obſerved, that this great man recommends the frequent application of the ſame remedy in the beginning of this diſorder. It will be alſo equally ſerviceable to add a little vitriol to the ſpirit of wine, or elſe alum or the like aſtringent, and repelling ſubſtances which have been recommended by Parey and others. Perhaps theſe remedies exert their efficacy by preventing the blood from paſſing into the ſmaller veſſels, and by conſtringing the veſſels, ſo as to propel their contents from the ſmaller towards the larger capacity of the tubes, and by that means reſolve the inflammation there ſeated. But all theſe remedies, however celebrated, are only ſerviceable where the burning has produced a reſolvable inflammation; for if the veſſels have been ſo far deſtroyed, or their contained juices evaporated to ſuch a degree, that there is no room to expect a reſolution of the concreted parts, nor a poſſibility of reſtoring the ſtagnant juices to their proper motion, in that caſe another method of cure is required, as we ſhall explain in the following aphoriſms.

" *Sect.* CCCCLXXXI.—*A burn which tends to a gangrene, which may be known from the ſkin being already turned into a cruſt, or elſe eroded and elevated into bliſters, is to be treated as an inflammation of the ſame nature, namely, by fomentations and cataplaſms of emollient and digeſtive remedies.* (402 *to* 454.)

" But ſince the burning cauſe does not always act with the ſame violence upon every point of the fleſh which it touches, we therefore frequently find that the inflammation is in ſome part reſolvable, and in others not at all, whence different remedies are to be applied to the different parts according to the nature of the circumſtances; as for example, when ſcalding water falls upon ſome part of the ſkin, that part which it runs over firſt will be injured more than the adjacent ſkin which it paſſes over afterwards. Hence in that caſe of the dyer's ſervant, who fell with his whole body into water almoſt ſcalding. Hildanus anointed almoſt the whole body with a mixture of ſalt, ſoap, crude onions, &c. formed into an ointment; but to ſome certain parts where the burn penetrated more deeply, the moſt emollient remedies. But *bleeding*, *cooling purges*, and the uſe of diluent medicines, can never be prejudicial, even though a reſolution can be hardly expected in the moſt violent burns. Since by theſe means, ſpeedily applied and diſcreetly

creetly repeated, even an incipient gangrene is often happily cured, more eſpecially when the face is burnt, from whence a diſagreeable ſcar or diſfigurement might be feared as long as the patient lives, or even ſometimes blindneſs itſelf, when the eyes or their adjacent parts have been thus injured*. A misfortune of this nature once happened to the celebrated author of theſe aphoriſms, when by the burſting of Papin's machine or digeſter, the moſt ſcalding water flew into his face, and penetrating through his cloaths, miſerably ſcalded his arm. His whole face was in a little time bliſtered, and his eye-lids ſo much ſwelled as totally obſtructed his ſight, inſomuch that he could not diſtinguiſh the light of a candle; he immediately ordered himſelf to be bled *ad deliquium*, and the next day cauſed the phlebotomy to be repeated, and afterwards took a pretty ſtrong purge, even though he was

* The following caſe I ſhould wiſh to call to the particular attention of the reader; the character of Boerhaave holds ſo high a rank upon the Continent, more particularly in the United Provinces, having been the Profeſſor at Leyden, that to differ with him in opinion, is there looked upon as hereſy; but though Boerhaave was without doubt one of the beſt of men, yet he was but a man, and as ſuch liable to err. I am very far from wiſhing to derogate from his exalted character, I am only induced to wiſh that prejudice ſhould not prevent us from making the moſt extenſive uſe of our ſenſes, in all natural facts which are ſubmitted to their teſtimony.

was reduced nearly to a ſtate of fainting by the weaker purges. He took care to have his face anointed only with *unguentum nutritum*, and covered with *emplaſtrum ex lapide calaminari*. After theſe profuſe evacuations, the tumour of the parts ſubſided; and by the uſe of a thin diet and plentiful drinking of cool liquors at the ſame time, the cure of this dangerous ſcald was ſo happily advanced, that after eight or nine days time he appeared again in public, with his eyes ſaved from ſo great a danger, for the great benefit of mankind in general. But yet an unſightly ſcar remained in his arm after a tedious ſuppuration, for there the ſcalding water inſinuating into the cloaths, continued to be applied for a longer time to the ſkin."

In theſe Commentaries, Van Swieten ſeems to have collected the opinions of his predeceſſors and cotemporaries in ſo clear a manner, that we may fairly ſuppoſe them to contain a candid account of all that was known upon the ſubject at that time. Therefore Heiſter and Van Swieten will ſerve as a ſpecimen of the variety of modes, and the different opinions which have induced them, among the older authors*.—I ſhall now bring forward the opinions of the moderns.

Mr

* I am well aware that the term *ancients* to Heiſter and Van Swieten may be objected to; but as they have given us an epitome

Mr Bell of Edinburgh, having compiled a ſyſtem of ſurgery, we ſhall look at the opinions given out by him for the treatment of burns; the copy of his work from which I ſhall take the following obſervations, is the third edition, printed in 1789. He ſays, "Burns, which do not deſtroy the cuticle, and which irritate the ſkin only, act nearly in the ſame manner as cantharides and other veſicantia. The irritation which they excite produces an increaſed action in the exhaling veſſels of the affected part, by which veſications are formed in extent and number proportioned to the violence of the cauſe.

"In every caſe of burn the pain is ſevere; but in general it may be obſerved, that it is more conſiderable where the ſkin has been merely much fretted or irritated, than where ſuch a degree of heat is applied as to deſtroy it entirely. In deep extenſive burns, mortification ſometimes takes place to an alarming degree very ſoon after the injury is inflicted, but for the moſt part the ſymptom we have moſt to dread is inflammation. The pain and

tome of the opinions of the ancients, I thought it better to let them paſs under that denomination, than to load my Eſſay with further quotations; as thoſe I am neceſſarily induced to make, for the illuſtration of the ſubject, may without any addition appear too large.

and irritation which burns excite, are in ſome inſtances ſo violent, that all our efforts are apt to fail in preventing them from inducing the very higheſt degree of inflammation: And when the ſurface of a burned part is extenſive, the effects of this inflammation are not confined to the ſpot which has more immediately ſuffered; they are apt to excite fever; and in many caſes ſuch a degree of torpor is induced, as at laſt ends in death.

"An abatement of pain may be procured by the application of remedies of very different, and even of very oppoſite natures;—by dipping the part affected in very cold water, and keeping it for ſome time immerſed in it, the pain will often be rendered very ſupportable; while on the other hand, a conſiderable degree of eaſe may be procured by plunging the injured part ſuddenly into boiling water, or any other fluid of nearly an equal degree of heat. Emollients are often employed, and in ſome caſes they procure immediate relief; but in general, aſtringent applications prove much more ſucceſsful. One of the beſt applications to every burn of this kind is ſtrong brandy or any other ardent ſpirit; it ſeems to induce a momentary additional pain, but this ſoon ſubſides, and is ſucceeded by an agreeable ſoothing ſenſation.—It proves moſt effectual when the parts can be kept immerſed in it; but when this cannot be done,

they ſhould be kept conſtantly moiſt with pieces of old linen ſoaked in ſpirits. The *acetum lithargyrites, a ſtrong ſolution of ſaccharum ſaturni, or Goulard's ſaturnine water*, make uſeful applications for the ſame purpoſe; and as a proof that it is the aſtringency of the remedy which the effects reſult from, the ſame benefit is derived from a ſtrong ſolution of alum, or even from common ink."

In comparing the above, as a work of the preſent day, with the opinions of Heiſter, &c. we find very little or no advancement in treating this accident, according to any principle. The knowledge we have of chemiſtry, indeed, enables us to ſimplify our applications, and teaches us not to make uſe of ſuch a farrago as they uſed to do; but though the means are ſimplified, they are even yet as contradictory;—heat and cold, emollients and aſtringents.—From this it will appear that though we are advanced in the circle of time, yet in the matter in point we are now where our anceſtors left us.

Thus much Mr Bell gives us in reſpect to the external means; we will now ſee how far he agrees with his predeceſſors in the general internal treatment.—"In this manner all ſuch burns as we are now treating of may in general be cured, excepting where they are ſo extenſive, as by the irritation which they produce, to excite much inflammation and fever.—In ſuch circumſtances

ſtances *blood-letting*, and other remedies adapted to the particular ſymptoms, muſt be adviſed."—There can be little heſitation, when blood-letting is premiſed, that the other remedies would be purging, and what is generally termed the whole of the antiphlogiſtic regimen, in which are included cooling drinks, aperient ptiſans, and low diet; thus the general means appear exactly the ſame as recommended by all former authors.

This view of the preſent opinions of the modern authors of our own country, will ſhew the great ſimilarity there is between them and their predeceſſors. To enable us to judge of the opinions of our brethren upon the Continent, I take the liberty of tranſlating the article *Brulure*, from the French Encyclopedie Methodique; it is from the edition of 1790.—I need ſcarcely make an apology for this, as many of my readers may not have had an opportunity of ſeeing the original work; the ſurgical part was compiled by M. de la Roche, phyſician to the regiment of Swiſs guards, member of the College of Medicine at Geneva, and of the Royal Society of Medicine at Edinburgh; and M. Petit Reael, Doctor Regent of the Faculty of Paris.

"Burn—a wound more or leſs ſuperficial, occaſioned by the contact of ſome ſubſtance, heated beyond the point which the body could bear, with-

out deſtroying its organization. Burns have a different appearance, according to the degree of violence the body exerted that produced them, and according to the kind of body which produced ſuch an effect. Thoſe which have only irritated the ſkin, differ eſſentially from thoſe which have corroded and deſtroyed it; and theſe laſt have a different aſpect from thoſe which attack deeper ſeated parts, ſuch as muſcles, tendons, ligaments, &c. Burns occaſioned by boiling water or by any other liquid are not like thoſe produced by the contact of any heated metallic body, or by the inflammation of any combuſtible ſubſtance. Burns which do not deſtroy the epidermis and only irritate the ſkin, are very ſimilar in their effects to cantharides and other rubefacients; the irritation they excite increaſes the action of the exhalent veſſels of the affected part, and the fluid which this furniſhes, detaches and raiſes up the epidermis, from whence ariſe the veſicles or bliſters, more or leſs numerous, or more or leſs extended, according to the manner the offending cauſe acted. But if the ſkin and adjacent parts are deſtroyed, no bliſters will appear; then a black and gangrenous eſchar is ſeen, and after the eſchar is thrown off, there remains an ulcer, more or leſs deep according to the degree of heat by which it was produced. The pain cauſed by a burn is always very great,

but

but in general greater when the ſkin has only been irritated upon its ſurface, than when it has ſuffered ſuch a degree of heat, as is capable of intirely deſtroying its organization. Sometimes one ſees a violent gangrene ſhew itſelf, and ſpread to an alarming degree, in the caſes where the burn occupies a conſiderable ſurface, and this very ſoon after the accident has happened: But in general, the ſymptom moſt to be dreaded in ſuch a caſe, is the inflammation: The pain and the irritation ſometimes ariſes to ſuch a pitch, in ſpite of all that can be done, that it is with difficulty the inflammation is prevented from going to the higheſt degree. And when the ſurface affected is of conſiderable extent, the effects of this inflammation are not confined to the parts which were firſt hurt, but they frequently extend to the ſyſtem, and cauſe fever; nay, in certain caſes, ſuch an engorgement is produced in the part as may terminate in death. The firſt thing to be done when one wants to relieve a burn of any kind, is to attempt to eaſe the violent pain by every poſſible means. When the ſtructure of the ſkin is not deſtroyed, but only irritated, one is enabled to moderate, and in ſome caſes to allay the pain by applications of a very different nature, and even directly oppoſite; as for example, one produces this effect by plunging the part burned, if practicable, into cold water, which

is kept in that ſtate by renewing the cold water, and retaining the part there; or if one cannot conveniently put the part into cold water, the keeping it conſtantly wet with ſponges dipped in cold water, or compreſſes repeated as often as they loſe their coldneſs. This method, which we have always at hand, and which is not in ſufficiently general uſe, is the beſt one can have recourſe to in the firſt moments, and that which will in the ſureſt manner prevent inflammation, if its uſe is continued a ſufficient length of time; one ought at leaſt to continue it ſome hours. What will appear very ſingular, and *which we ſhall not undertake to explain*, is, that the ſame effect is obtained by rapidly plunging the part which has ſuffered into boiling water; a remedy, notwithſtanding, which we ſhall not recommend, and whoſe uſe is very precarious. Emollient applications are frequently uſed, and ſometimes with ſufficient ſucceſs, but in general it is not theſe which ſucceed the beſt; thoſe which are of an aſtringent nature produce the moſt marked effect. It is with this view that brandy, and even ſpirit of wine, applied to a burn, relieves the pain, though at the firſt inſtant it renders it more acute. For obtaining all the poſſible advantages from theſe ſtrong liquors, it is neceſſary either to keep it plunged in, or continually moiſtened with compreſſes wet with the ſpirit. Goulard's water

is alſo advantageouſly uſed for the ſame purpoſe, or a ſolution of the ſugar of lead. Alſo other aſtringent applications as ink, or a ſtrong ſolution of alum. It is in general thought that theſe remedies act by the preventing the formation of veſicles or bliſters, which ſuperficial burns commonly give riſe to; although it does not appear that this idea is well founded; for aſtringent and ſpirituous applications eaſe the pain more immediately when the epidermis has been detached from the ſkin, than when they are immediately employed after the accident took place, and before the bliſters have ſufficient time to be formed. Whatever means we employ, we ſhould continue its uſe as long as there is a continuance of pain; and in caſes of very extenſive burns, attended with much irritation, it will be well, independent of external applications, to give ſome doſes of opium, proportioned to the acuteneſs of the pain; it is this medicine, amongſt all thoſe we can employ, that will ſucceed the beſt in preventing that ſtupor which people, who have met with ſuch accidents, frequently fall into;—a ſymptom which appears to depend entirely on the violence of the irritation cauſed by the action of the heat. The bark is likewiſe employed with much ſucceſs, to combat this ſymptom, and above all, in thoſe caſes where the wound carries any appearance of gangrene.

When the epidermis is raiſed in the form of bliſters, there are ſome who adviſe that they ſhould be opened; whilſt on the other hand, there are who ſay, they ought not to be touched. It is certain that in opening them, the pain is ſometimes much increaſed, but more particularly ſo when they are opened too ſoon, and before the ſtate of irritation cauſed by the burn has ceaſed; the leaſt admiſſion of air to the ſurface of the ſkin deprived of its epidermis, is at this ſtage extremely painful; but when the irritation is over, the bliſters may be opened without fear, to allow the eſcape of the ſerum they contained; it ought to be done then, leſt the ſerum, remaining too long upon the ſurface of the ſkin, ſhould produce a degree of ulceration, as ſometimes happens when it is not abſorbed ſufficiently quick by the lymphatic veſſels. But it is better, even at this period, to open them by ſimply pricking them, than by large inciſions; by which means the air will have the leaſt poſſible acceſs. After the ſerum is evacuated, the beſt topical application to the part, is a liniment made with oil, wax, and a little ſugar of lead. Oil alone has not a ſufficient conſiſtence, and runs off too quickly; and ointments which are ſtiffer are more uneaſy than a liniment, becauſe they neither apply ſo well, nor are they taken off with ſo much eaſe. With this mode of treatment, all burns of which

we have been ſpeaking will be eaſily cured; that is to ſay, thoſe that are ſuperficial, unleſs they are of a great extent. For in ſuch caſe they ſometimes excite a violent inflammation, and much fever; and then it is neceſſary to have recourſe to bleeding, and ſuch other means as the particular ſymptoms that ſhall happen may indicate. And when a diſpoſition to ulcerate is obſerved in the part, ſuch remedies are to be uſed as the nature of the ulcer ſeems to require. In caſes of burns, where, from the beginning a loſs of ſubſtance has taken place, as happens when it has been cauſed by the application of a metallic body heated to a certain point, that which ſucceeds the beſt in eaſing the pain, after the application of cold water ſufficiently long applied, is the uſe of ſoft and cooling emollients. A liniment compoſed of equal parts of lime-water and olive, or linſeed-oil, with which the affected parts are kept conſtantly moiſt by means of a ſoft bruſh, gives in general marked and often immediate relief. The patient ſuffers much by the application of any ſort of bandage; an inconvenience which will be avoided by the means which we recommend. But as ſoon as the pain and irritation occaſioned by the burn ceaſes, the part affected muſt be covered, and treated in the ſame manner as if it had been an ulcer ariſing from any other cauſe. The liniment of lime-water and

oil

oil which is mentioned, is one of thoſe which gives the greateſt eaſe. Nevertheleſs, ſometimes one ſucceeds as well, and even better, by the help of Goulard's cerate, or other analogous topical means.

" In the caſes of burns by the exploſion of gunpowder, there is often a greater or leſs number of the grains of the powder lodged in the texture of the ſkin; theſe grains greatly increaſe the irritation; and if they are not taken away, they commonly leave marks which are never eradicated. It is therefore neceſſary to take them away with the point of a needle as ſoon as poſſible after the accident; and, with a view to diminiſh the inflammation, as well as to diſſolve and draw away the particles of powder which might ſtill remain, it will be as well, for one or two days, to cover the affected parts with an emollient cataplaſm. In other reſpects, theſe ſorts of burns ought to be treated as the others. When the burn affects two contiguous parts, they are liable to form adheſions together, if precautions are not taken to prevent them. This moſt commonly happens to the fingers and toes; alſo to the noſtrils and eye-lids. The ſureſt way to prevent theſe adheſions, is to keep the parts ſeparated by pledgets retained in their ſituation by any convenient bandage. It will be well to obſerve in this place, that in the

treatment

treatment of ulcers occaſioned by burns, one often obſerves the fleſh to take a ſoft conſiſtence, to become fungous, and to riſe above its natural level. When they put on this appearance, we muſt abandon emollient topical applications, and ſubſtitute in their place thoſe which are rather of an aſtringent nature, and gently compreſs the part by means of a bandage. The ſurface of the ulcer ſhould be bathed with Goulard's water, lime water, or a ſolution of alum, and it ſhould be dreſſed with an ointment with prepared tutty. Theſe means will in general be ſufficient to repreſs the growth of fungous fleſh; but ſhould it ſtill continue to ariſe, one may apply ſome burnt alum, vitriol, or *lapis infernalis*, to deſtroy it."

This article from the French Encyclopedie, in many parts, bears ſo ſtriking a reſemblance to the former quotations from Mr Bell's ſyſtem, as to leave little room to doubt, that the one in a great meaſure has been taken from the other. I rather ſuppoſe theſe gentlemen have written the above article ſtrongly impreſſed with ſome theoretical notions; they very ſtrongly recommend the application of cold water, and ſeem to regret that it is not ſufficiently had recourſe to.—Hot water is alſo recommended to plunge the part into, which they ſay gives immediate relief; *but they do not undertake to explain it.* Cold certainly decreaſes the

pain

pain during its application, but makes it leſs ſupportable upon the leaſt application of ſubſequent heat; whereas, heat does not increaſe the pain, but makes the exceſs of it which had produced the pain, leſs obſervable.

In my attempt to do away prejudice, I muſt avoid the imputation of being affected by it myſelf, and ſhall therefore relate a caſe in which cold water is ſaid to have performed a cure;—it is related in La Medicine Eclairée, publiſhed in the year 1792*.

*Extract of a Memoir communicated to M. Fourcroy, on the treatment of burns.*

"The moſt ordinary diſeaſes and the moſt common accidents are the worſt treated, as blind empiriciſm has multiplied the means of cure. A burn is a ſtriking example of this. There is no accident for which we have a greater number of remedies;

* La Medicine Eclairée is a work of great merit, conducted under the auſpices of Monſ. Fourcroy; it was begun in 1791, and conducted for two years; two ſheets were printed every fortnight, which formed two volumes annnally; at the cloſe of 1792, the author laments the circumſtances which oblige him to deſiſt the work in its preſent form, and adds, that though his *zeal* is retarded, it will not be diminiſhed, as he continues to collect every intereſting fact relative to the healing art, and when his materials will permit, a volume will be publiſhed; no more has *yet* appeared. The work itſelf not being tranſlated, will be an apology for inſerting the whole upon burns.

remedies; and at the ſame time there is none where the curative power is leſs aſcertained;—each family has its receipt, and each empiric his ointment;—to ſuch a degree of abſurdity is this carried, that with reaſon the term *noſtrum* is meant to denote any uſeful or dangerous ſecret. This multiplicity of means to cure burns proves that none of them have the power, and that Nature muſt do her own work. It would be very fortunate if none of theſe pretended means did not retard the operations of Nature. It will be impoſſible to entertain any other idea of theſe ridiculous and abſurd mixtures, when we look at their compoſition; but more particularly when it is known that they are recommended in every ſpecies, as well as in every ſtage, of burns. If any authors have given rules concerning this treatment, they are ſo different among themſelves, as glaringly to ſhew the neceſſity of ſubmitting this ſubject to new diſcuſſions: In this point of view ſelect facts ſhould be collected and compared, and none but juſt inductions be drawn. It is not enough to divide the remedies into heating and cooling, moiſtening and drying, tonic and relaxing, nor burns themſelves into ſuperficial, as thoſe of the ſkin, and others of the deeper ſeated parts, or to conſider the general difference of the burning matters, but we muſt even yet follow the road pointed out by Fabricius Hildanus,

Hildanus, who is the author that has beſt treated this part of our art, and apply the moſt convenient treatment to each ſpecies of burn, and to the particular circumſtances as they ariſe. But above all, we ought to ſtudy the prognoſtic; and to know, that if in general deep and extenſive burns are troubleſome, yet thoſe of the ſkin are often more dangerous, from the violence of the pain, the profuſe ſuppurations, and the quick manner in which they weaken and exhauſt the patient. A treatment without rule expoſes us to the ſame danger. The antients thought that in order to cure burns, it was only neceſſary to extract the *empyreuma* fixed in the burnt part: They attempted to draw out the fixed fire from the part burned. Fernelius regards *fire* as the *true remedy* for the evils it produces. Fabricius Hildanus adviſes the immerſion of the part into water as hot as can be endured. Fallopius recommends this alſo as one of the beſt means. Dry heat, according to all theſe authors, had the property of preventing the formation of veſicles or bliſters. Van Swieten in diſcuſſing at length this ſubject, Heiſter and Parey, all recommend the ſame, and ſupport their own opinion by their own experience; but all agree that it is only uſeful in ſuperficial burns, and at the time of receiving the accident. It is with the ſame intention that alcohol, and all remedies which are denominated

nominated ſpirituous, are recommended. Sydenham adviſes alcohol in recent burns, not only, as Van Swieten ſuppoſes, to reſolve inflammation, but to prevent it. He (Swieten) would have ſpirits of wine inſtantly uſed, to prevent ſuppuration and diſſolution. Applied later, it might be dangerous, and give riſe to more diſtreſſing ſymptoms. Van Swieten does not adviſe the uſe of alcohol in deep ſeated burns cauſed by gunpowder, boiling oils and reſin, or other very hot bodies, for fear of hardening the eſchars. Notwithſtanding it is a certain fact, that the drier eſchars are, the more eaſily are they detached from the living fibres. The emollients, and ſoftening relaxing ointments recommended by Van Swieten, frequently retard ſuppuration, and give riſe to a foul putrid ulcer; the more to be feared, as it is what we ought particularly to guard againſt in burns. In obſerving what paſſes in burns made by art, ſuch as the actual cautery, or by means of moxa, we may form ſome juſt idea of what happens in accidents of this kind. We know that the falling of a dry eſchar is retarded by the application of unctuous bodies; that if it is not divided, it does not fall off until ſome weeks; that a ſlow inflammation is excited around the edges, which is oppoſed by relaxing and ſoftening means. But on the contrary, by drying it by the uſe of ſpirit of wine, and dividing

viding it, and then putting the lint into the ſcarifications impregnated with the Egyptian ointment,* the cellular membrane below is hardened, ſuppuration takes place in a few days, and the falling of the eſchars ſhews the healthy fibres below diſpoſed to cicatrize; whilſt thoſe which appear after the fall of an eſchar treated by relaxing means, are ſoft and fungous. We may therefore conclude that the common method of treating eſchars from burns, by oily, unctuous, and relaxing means, is highly pernicious. Van Swieten, in throwing aſide the uſe of ſpirit of wine, and recommending the uſe of relaxing methods, has certainly fallen into a very great error. In vain he brings forward an obſervation of La Motte, which we will relate.—"This ſurgeon was called to the aſſiſtance of a young girl who had fallen on her face into the fire in an hyſteric fit, and, in attempting to diſengage herſelf, fell backwards, ſo that ſhe was burnt in the face and neck to the breaſts, and behind from the nape of the neck to the ſhoulders; rags moiſtened with ſpirit of wine were applied immediately, and continued for three days; but the pain increaſed, and the blackneſs which was apparent on the firſt day ſpread on all ſides, accompanied by an inſupportable cadaverous ſtench. The face was more ſlightly

* This is the *Mel Ægyptiacum* of the ſhops.

ly burnt than the reſt; but from the chin to the breaſts, and from the nape to the lower part of the ſcapulæ, there was only one gangrenous and one dry cruſt. Deep ſcarifications were made, the Egyptian ointment diſſolved in ſpirit of wine was applied, and the whole covered with compreſſes moiſtened in the ſame liquor. Nevertheleſs, all the parts became very dry, and as no appearance of ſuppuration enſued, theſe means were deſiſted from. The parts were then dreſſed with a ſoft cerate compoſed of yellow wax, olive oil, and the yolk of eggs roaſted under the fire. Three days after the uſe of this, the parts became moiſt, and the dead eſchars began to fall pretty quickly, ſo that in the ſpace of a month the whole was tolerably clean. It was four months before this patient was cured. Van Swieten draws the ſame concluſion as La Motte, who, after this and ſome ſimilar facts, declaims much againſt the uſe of ſpirits of wine, and pretends that his ſoftening ointment is able to obviate every untoward ſymptom that may ariſe in the treatment of burns. It is very evident that the alcohol uſed in the firſt inſtance dried the eſchars, which, had it not been applied, would have followed that tendency to corruption and gangrene which takes place in all burns, and would undoubtedly have deſtroyed the

ſubject. La Motte is miſtaken in regard to the pretended inconvenience of this remedy, as well as in the pretended power which he aſcribes to his ointment of cauſing the ſuppuration; the very caſe itſelf proves the drying power of alcohol. It is equally true that alcohol, though extremely uſeful in the firſt inſtance, may prove highly pernicious when a great inflammation has ſucceeded to the firſt effects of the burn. Repellents have been much boaſted of; we are told they throw back the blood and humours which are carried to the burnt part, and that they reſiſt the formation of bliſters. Ink is the moſt common of theſe remedies, and if its ſucceſs is moſt common in trifling caſes, yet there are examples of its utility in very ſerious caſes. Diermerbroeck gives inſtances of this in his works: A man wiſhing to extinguiſh a kettle of melting reſin which had taken fire, he took a pillow, and in his hurry plunged his arms into the inflamed matter; the pain he had in conſequence was extremely ſevere. Diemerbroek ordered a ſervant to bring a large ſtone bottle of ink, which he had juſt made, and poured it into a large veſſel, in which he made the man plunge his arms, and keep them there for half an hour, at which time the heat and pain were diſſipated, nor were there any bliſters formed, ſo that this burn had

had no other ill conſequence. In caſe ink in a ſufficient quantity ſhould not be at hand, ſtreet mud may be uſed as a ſubſtitute. Panarole, an Italian Phyſician, recommends that if mud cannot be found, to make artificial, by mixing water with ſtreet duſt, or the ſweepings of houſes. Onions have been much boaſted of. Fallopius ſays he has tried them ſucceſsfully upon himſelf. Fernelius ſpeaks of the powers of a poultice made with peeled onions and ſalt in ſuch caſes. Parey remarks, that it ſhould only be uſed when the ſkin is not deſtroyed, and that it prevents bliſters. Fabricius Hildanus adds to the onions, white Venice ſoap, oil of ſweet almonds, and oil of roſes, ſo as to form a maſs of the conſiſtence of an ointment. He quotes many caſes in which his application was of uſe; particularly to his wife, who had burnt herſelf by imprudently plunging her hands into ſome wine ſhe was cooking. It is difficult to account, amongſt ſo many different boaſted remedies, and the many atteſted proofs we have of their efficacy, why authors have never mentioned the application of *cold* liquors. Inſtinct which carries a burnt perſon to the application of cold, the moſt natural of all remedies, we might ſuppoſe, would have induced ſurgeons to have made trial of its efficacy. The following obſervation will ſhew us

that the mere renewal of cold water is one of the moſt precious means we are acquainted with.

*Obſervations upon a burn communicated by Monſ. Emaſle, in the month of February*, 1774.

" A ſervant girl taking a large pot from the fire, ſpilt a portion of the hot broth upon her fore arm. Emaſle happening to paſs through the kitchen at the ſame time, he immediately made her expoſe it to a ſtream of cold water which was conveyed to the kitchen by a cock; he was determined in his choice, as it was the readieſt application that he could find in the moment. The girl had ſufficient perſeverance to ſubmit to this application for more than an hour; her arm was covered with flour, (a remedy recommended to her by one of her fellow ſervants.) On the evening of the ſame day ſhe walked about without feeling any pain; on the following day when the arm was cleaned, it appeared in a healthy ſtate, only ſome days after the cuticle peeled off. This obſervation may have its uſe; it ſhews the ſucceſs of cold water in burns, and ſeem to leſſen the opinion of Van Swieten, who ſays, (in the Commentary upon the 480 Aphoriſm of Boerhaave De Combuſtione;) it is obſerved that all lotions or topical applications uſed cold, produce a pernicious effect in burns.

This

This aſſertion appears to have been advanced in too deciſive a manner, as it may ſet aſide an efficacious remedy; the commentator ought to have divided the different ſtages of burns, and to have brought into one point of view what was indicated in each; in having made theſe diſtinctions, he would have developed the eſſence of burns, and appreciated the true value of the action of cold. If it ſhould be proved, from obſervations, that it is dangerous when a part is much inflamed and engorged, perhaps others may be found wherein it would be ſucceſsful, as in the inſtant of certain ſpecies of burns happening. In reality does not cold claſs with repellents, and why may it not be conveniently employed to throw back the flux of humours from the part, and to prevent or moderate the engorgement? Do not we ſee every day that in ſprains, when the foot is put into cold water, the action of cold produces the moſt ſalutary effects, provided that it is immerſed in the inſtant? Thus it is with burns; allow the firſt moments to be neglected, and the regular practice will not then allow ſuch proceedings. When the tiſſue of the ſkin is burnt, and relief has not been given in the firſt moments of the burn, the bliſters are cut, and are dreſſed with ſome cooling ointment, as populeum cerate, linſeed-oil with lime-water, or nutritum; notwithſtanding ſeveral facts

prove that theſe greaſy applications aggravate the ill. The example of Boerhaave, who treated himſelf for a very ſevere burn of the face, from the vapour ariſing from the burſting of Papin's digeſter, does not increaſe our hopes, as he, from the application of nutritum, had a long and tedious ſuppuration. The ſame conſequences are frequently obſerved in military hoſpitals, in the caſe of burns produced by exploſions of gunpowder in the parks of artillery. The ointments which are uſed frequently produce tedious ſuppurations, and leave the fibres in a ſtate of ſoftneſs and inertia, which ſets aſide cicatrization, and exhauſts the patients. Fabricius Hildanus was aſtoniſhed to find more than half a pint *(demi livre)* of pus upon the leg of his ſervant who had ſcalded herſelf with boiling water; ſhe was dreſſed twice a day. The ſame fact takes place in bliſters, and may be ſeen every day. All greaſy and relaxing applications inevitably produce this effect; therefore the cure muſt always be compleated by abſorbents. Lime-water and the oxyd of lead are the principal. We ſee that the eſchars produced by burns, ought always to be ſcarified to prevent too abundant collections of matter which take place underneath them. We ſhould not ſpare theſe ſcarifications; they ought rather to be increaſed, in order to bring it to the ſtate of a ſimple wound. The in-

ciſions

ciſions ought to croſs, ſo as to preſent ſeveral angles. It was for the want of ſuch a proper treatment as this, that King Staniſlaus fell a victim to his burn. By great attention in the dreſſings, and a ſcrupulous exactneſs, we frequently obtain a cure in burns of the moſt ſevere and deſperate kinds."

I cannot agree with Mr Emaſle in the concluſions he draws from this caſe, of the uſe of cold water; nay farther, it appears to me a ſtriking caſe againſt its general uſe. What takes place in this cure?—The part was thrown into a diſeaſed and violent action by the application of hot broth; to cure which, this action was paralyſed by the application of cold, or ſubtraction of heat:—Nay, this is not enough, it muſt be continued until the vital principle of the part ſo excited, is deſtroyed, or otherwiſe the pain returns with redoubled violence, ſo that this ought to be termed the *killing cure;* for any thing ſhort of this, as the accurate Hunter has obſerved,* would be ineffectual; to

 what

* Cold leſſens all inflammations, and is a very good application where it can be applied, but it cannot be applied ſo univerſally as many others: however, cold has this diſadvantage, that the pain, although removed while under the application, occurs with double force when it is removed, much more than from any of the applications; and the reaſon is evident, for as the warmth returns, the pain is increaſed by the warmth, even in the ſound parts. On the

what a train of untoward ſymptoms would the ſyſtem be expoſed, were we in an extenſive burn obliged to ſubmit the living parts to the torpor that would take place, in applying cold in a ſufficient degree, and for a ſufficient time to kill the diſeaſed part! In the caſe alluded to, the connecting medium of the ſkin and cuticle was killed, as the cuticle fell off in two or three days after. In very ſlight caſes, where the pain is great and the injury ſmall, the death of the part may be adviſeable; but in general, it is our duty to keep the vital principle in every part as long as we can. Theſe obſervations I hope will appear clearer after the peruſal of the remaining part of the Eſſay, in which an oppoſite principle is wiſhed to be eſtabliſhed.

*Obſervations on a ſevere burn of both legs, by Monſ. Didier the elder.*

"In the month of September, 1773, a perſon taking from the fire a mixture of oil and turpentine, it inflamed and fell to the ground, when a young man, a ſtudent in pharmacy, wiſhing to aſſiſt

the contrary, it is recommended, when a part is burnt, to hold it to the fire as hot and as long as it can be held, which undoubtedly leſſens the ſucceeding inflammation, and ſoon gives eaſe. This I have often ſeen, and probably it can only be accounted for on the principle of producing the act of contraction in the veſſels.—*Hunter on the blood, inflammation, &c. p.* 218.

aſſiſt in putting out the flames, received a great portion of this matter upon his legs; his cloaths immediately took fire, when, with great preſence of mind, he ran and threw himſelf into a large veſſel, where he made them throw ſeveral pails of water upon him to extinguiſh the flames: While in this ſituation he had no other deſire than to remain immerſed in the water, and wiſhed to increaſe its efficacy by adding ice; but being obliged to deſiſt by the advice of his friends, he left his ſituation, and placed his legs in a bath of ſpirit of wine, where he remained an hour. Having come at this period, on examination I found the burn extended from the knee to the ancle of each leg. The cuticle was totally deſtroyed, and expoſed the ſkin to view, of a dirty white colour, hard, dry, and ſtretched. The firſt indication which ſtruck me as neceſſary, appeared to be a ſalutary relaxation of the parts, to procure which I covered the parts with lawn paper, ſpread with recent populeum [this is an emollient ointment made with wax and palm oil, &c.] To prevent any accident ariſing in conſequence of inflammation, and to abate the violent agitation in which my patient was, I bleed him twice the ſame day. In ſpite of which, he became very feveriſh, and was delirious during the night. The following day, when the dreſſings were taken off at a conſultation, we found the whole

whole of the ſkin black, dry, and ſtruck with a gangrene. Not entertaining any hope of preſerving the ſkin, with a view of accelerating its being thrown off, and preventing the evil conſequences of a deep ſeated ſuppuration, which would neceſſarily take place internally, we thought proper to make ſcarifications, and even inciſions. The dreſſings were afterwards applied according to art, and in the ſpace of a fortnight the eſchars began to fall, and expoſed the muſcles of the legs for the whole extent of the burn. In this ſtate I ſubſtituted inſtead of the firſt dreſſings [it does not appear whether theſe firſt dreſſings were the populeum at firſt applied, or any other application *according to the rules of art*, as mentioned being applied after the ſcarifications] equal parts of cerate [*ung. é lapide calaminari*] and populeum; large ſoft pledgets of which were applied. The ſuppuration was for a long time very abundant; to moderate which, greaſy applications were deſiſted from, the uſe of which is indicated only in the firſt moments; and recourſe was had to wine with honey, and, in the end, dry lint. Cicatrization began pretty quickly around the edges, which was encouraged by applying pieces of cloth dipped in the Nuremberg plaſter [I do not know its compoſition.] Small points of cicatrization were imperceptibly formed in the different parts of the wound, and made as it were ſo

many

many little iſlands, which ſoon joined with each other, and blended themſelves with the circumference, ſo as to form a greater number of curative edges, which appeared to multiply the powers of Nature. The part of the wounds which was over the gaſtrocnemii muſcles, reſiſted for a long time every means that could be uſed to them. Nature ſeemed fatigued with her exertions, and the cicatrices remained for ſome time ſtationary; even thoſe which carried the appearance of being well formed and ſtrong, began to give way here and there. Theſe circumſtances were frequently attributed to the irregularity of the patient; but they more eſſentially depended upon the very rudiments of the ſkin being deſtroyed. The muſcles being laid bare, the proceſs of ſkinning was with difficulty carried on upon the muſcular fibres, which offered no good baſe for its formation. Continually expoſed to the involuntary contractions of the muſcles, the tender new formed ſkin was frequently torn and deſtroyed, and often, at the end of a week's dreſſing, the wound was more conſiderable than before. It was with the greateſt difficulty that the laſt point of cicatrization was accompliſhed.—With this view I have been induced to point out the difficulty, to ſhew the inefficacy of the variety of means pointed out by intereſted people, as a radical cure of ſuch a ſerious accident.

Beſides

Beſides theſe means, many aſtringent lotions are recommended; ſuch as a decoction of ariſtolochia, plantain water with prepared tutty, a decoction of Peruvian bark in wine, and many *etceteras*. That which ſucceeded the beſt with me, was a ſolution of *lapis infernalis* and dry lint: Yet by employing all theſe means, it required a full eighteen months to cure the right leg, and more for the left. After ſome time the right leg acquired ſtrength and motion, ſo that he was enabled to move about with the aſſiſtance of crutches, hoping that the left leg in time would recover its powers. The ſeverity of the accident, the oppreſſive poſition the patient was obliged to keep, made him fear he ſhould loſe the uſe of his legs. I always kept up his ſpirits, by aſſuring him of the contrary, and I have not been diſappointed; time, with proper and repeated flexions, partial warm baths, and rubbing the part with a pomatum, reſtored to the muſcular parts their ſoftneſs, and, to the joints their motion."

The above caſe, as related by Monſ. Didier, was certainly a very bad one, and conſumed a great deal of time, as well as required infinite care, during its very tedious treatment: The circumſtances are related with great candour, and I hope I ſhall not be accuſed of a wiſh wantonly to blame any perſon, ſhould I even in this inſtance ſay, that I believe the ſymptoms were rather aggravated than relieved

relieved by the faculty. I ſhall afterwards make the ſame confeſſion in my own practice, which muſt be my apology. The firſt treatment was inconſiſtent; cold was applied to render torpid the increaſed action of the part affected, but not long enough continued to effect its purpoſe, conſequently the irritability of the part was accumulated, and then, inſtead of being treated as a part torpid with an increaſed irritability, it was excited by alcohol; this, of all modes of treatment ſeems to be the worſt conceived; no principle determines it, and the unhappy conſequences that followed this inconſiſtency was carried ſtill farther; for after the alcohol had ſtimulated the parts, after their irritability had been accumulated, the mode was then changed again, and the ſoft populeum was applied. The ſcarifications were both uſeleſs and pernicious, and is highly probable that the parts were then dreſſed with the Egyptian ointment and ſpirit;—the idea of a deep ſeated ſuppuration from ſuch a ſuperficial injury is abſurd; it becomes the buſineſs of the ſyſtem to throw off ſuch injured parts; and according to its energy, that will be done in a longer or ſhorter ſpace of time. I hope I ſhall afterwards ſhew by obſervations taken from actual attendance, in a great number of caſes of a ſimilar tendency, that to bleed and otherwiſe debilitate the patient by what is called the *antiphlogiſtic regimen*,

(in

(in the firſt moments) is a plan pregnant with the moſt dangerous conſequences. To do this is one of my great objects; and if I can do it with half the energy I feel it, I have no doubt it will anſwer the purpoſe I intend.

*Obſervations upon an extenſive burn, by Monſ. Reyne, ſurgeon, at Vaucouleurs.*

" On the 27th of October, 1774, a young woman of 28 years of age, was brought to the hoſpital of La Charité;—in a paroxyſm of epilepſy ſhe had fallen into the fire, and was alone at the time of the accident. Having been ſent for to give her aſſiſtance, I found her in a moſt deplorable ſtate, ſuffering the moſt excruciating torments. The ſuperior extremity on the left ſide, from the upper and middle part of the humerus to the ends of the fingers, preſented only one ſcorched ſurface, hard ſtretched, and no appearance of bliſters; the accident was the moſt ſevere at the inferior part of the extremity, and ſtill more ſo on the anterior and inferior, than on the poſterior and inferior. The wriſt as well as the fingers were of a black colour. Theſe parts were all conſiderably diminiſhed in ſize; and the two laſt phalanges were ſo contracted as to loſe the power of extenſion. The motion even of the lower with the upper arm could

could not be executed without violent pain. The left breaſt, as well as the anterior part of the thigh and leg of the ſame ſide, were pretty deeply burnt. The right ſide, though leſs expoſed than the left to the action of the fire, did not eſcape without feeling its effects. The burn extended not quite ſo high on this arm as the other; the fore arm, the wriſt and the fingers were ſpared in different parts anteriorly. Bliſters were obſerved in different parts of the breaſt, abdomen, and thigh of the right ſide. At the very ſight of ſuch a terrible accident, the firſt impulſe was to abate the pain; I opened the bliſters to diſcharge the extravaſated ſerum, and made an ointment with linſeed oil, virgin wax, and calamine ſtone;—all the parts that had been expoſed to the action of the fire were covered with plaſters ſpread with this, upon lawn paper. The patient was *twice bled* that night, and *once* the following morning. In the taking off the dreſſings, which was done at the end of four and twenty hours, little change had taken place; the plaſters remained equally moiſt, except in thoſe places where the bliſters had been, and the pain was little diminiſhed. I continued theſe dreſſings during three days, when the burnt parts began to exhale a thick fetid vapour. The wriſts and fingers of the left hand were the only parts which did not give this ſign of *volatility;* this made me fear

that

that the vital action of this part was deſtroyed. The great extent of the wounds, and the frequency of the dreſſings, which I foreſaw muſt be the conſequence when ſuppuration was eſtabliſhed, induced me, from motives of œconomy, to make uſe of an ointment which I had frequently ordered to poor people, and ſeen uſed with ſucceſs. Lemery praiſes it very much, and ſays there is no application of ſuch general uſe, in all ſpecies of burns, and in all ſtages. It is made with two parts of hog's lard, and one of freſh horſes' dung, fricaſſeed together for ſome time over a ſlow fire, and then ſtrained. Two days after this the uſe of the ſkin became much ſofter, and roſe in thoſe parts where the burn was the moſt ſuperficial. The wriſt and fingers of the left hand alſo gave the ſame marks of life, which, as I have before mentioned, were ſhewn by the others. As ſoon as the ſuppuration was eſtabliſhed, I cut off the eſchars as they became detached, ſo that the body of this poor girl was covered with deep ulcers. The ſuperior extremity of the left ſide having, as I have already remarked, ſuffered the moſt, it had the deepeſt ulcers; there were places where the bone was expoſed, and the extenſor tendons of the fingers were partly deſtroyed; thus the flexors having nothing to counteract their action, drew in the phalanges. Notwithſtanding this, as ſoon as the parts which covered them were

a little ſoftened, I was enabled to bring them into their proper poſition; the capſular ligaments were bare and open in ſome points, ſo that I deſpaired of ſaving them. To have taken them off would have ſimplified the cure materially, but the deſire of ſaving for the poor girl ſuch uſeful and neceſſary organs, induced me to make every attempt in ſeconding the efforts of Nature for this purpoſe; and I had the ſatisfaction to find that my endeavours in this point were not fruitleſs. After a month of this treatment, when the expoſed fibres looked healthy, and the ſuperficial ulcers were drying, the cure was ſtopped and retarded by an accident, the cauſe of which I could not divine. A general leucophlegmatic habit, with a tendency to an aſcites, on a ſudden ſhewed itſelf. The ulcers diſcharged a great quantity of ſerum; and the fibres, which were before red and healthy, became white, flabby, and fungous. I had my fears for the life of my patient; but by the uſe of the aperient remedies generally reſorted to in ſuch caſes, this diſeaſe diſappeared almoſt as quickly as it came. The ulcers did not eaſily recover their former healthy ſtate, yet by time and proper treatment, I ventured to hope for a perfect cure. On the whole ſurface of the burnt parts there daily aroſe points of drying [ſkinning] according to the depth of the wound; theſe increaſed their circum-

ference, and joined each other. Water retiring from an unequal ſurface after an inundation, will give us a tolerable idea of the appearances that took place. At the end of ten weeks the breaſt, the right arm, the abdomen, and the thighs were cured; and there only remained the left breaſt, a part of the fore arm, the wriſt, and the fingers of the ſame ſide. Theſe ulcers were of a much more obſtinate tendency than the others; they even yet required three months more dreſſing. The breaſt was nearly deſtroyed by the great ſuppuration, the extenſor tendons of the fingers and the metacarpal bones both exfoliated; and notwithſtanding all my care, the fore and middle fingers could not be preſerved. During the whole of this long cure I always uſed the ſame ointment to the ſoft parts; and to the denuded bones, lint dipped in tincture of myrrh and aloes. To prevent an anchyloſis the joints were made to perform their proper motions, and I retained them in a ſtate of extenſion to prevent the unpleaſant conſequences of forming the cicatrix in a ſtate of flexion. In the beginning the patient was put *upon a ſevere regimen.* I made her take *cooling ptiſans*, and *calming ſoothing potions.* She was diſcharged from the hoſpital in the month of April following, having been there ſix months; ſhe was afterwards enabled to gain her livelihood by ſpinning cotton, with the fingers that remained.

What

What is worthy of remark is, that during two years and a half ſhe has been cured, the fits of epilepſy have been more diſtant the one than the other, and of ſhorter duration than before."

The above caſe, communicated by Monſ. Reyne, does not raiſe his mode of treament very high in my eſtimation. There undoubtedly was a ſtricter adherence to principle than in the former caſe. This, ſo far as it goes to enable us to draw clearer inductions from it, is the better; as I hope a number of the ill conſequences may fairly be imputed to the treatment.—The external means from the firſt were of the ſoothing or cooling nature, and the general or internal means were highly ſo;—two bleedings in one day, and one the following morning; with a ſevere regimen, cooling ptiſans, and ſoothing potions, to a poor weakly girl ſubject to epileptic fits!—I am only ſurpriſed that her ſyſtem was enabled to withſtand ſuch treatment.—From the very account given of the volatile or ammoniacal ſmell of the eſchars, it would appear that the ſyſtem had ſo little a ſhare in throwing them off, that they rather appeared to be undergoing a chemical decompoſition, than under the influence of a vital proceſs. The dropſical appearances which took place afterwards, no doubt originated, in a very great degree, from the ſame debilitating mode of treatment.

The former part of this memoir is drawn up with great accuracy, and places in a very ſtrong point of view the want of principle in our former treatment of this accident. The remedy they offer to notice, viz. cold, does not appear to me to poſſeſs the powers we want; nay, on the contrary, it is diametrically oppoſite; but as this is a poſition in which I hope its inefficacy may more clearly be pointed out, it perhaps is better than if it had been *nearer* the truth.

In converſing with an ingenious friend, who is a ſurgeon in the navy, of conſiderable practice and nice obſervation, he informed me, that when his ſhip was at Barbadoes during the American war, ſome of the men were much burnt by an exploſion from ſome gunpowder; they were immediately ſent to the naval hoſpital, and the whole of the method uſed for their relief was nothing further than anointing them with oil by means of a feather, and that thus they remained tormented for a few days, when they expired.

A gentleman who received his medical education at Whitehaven, where accidents of this claſs frequently happen, informed me, that the oily applications, and the antiphlogiſtic regimen, are the only means uſed by the faculty in that diſtrict. In ſhort, I have converſed with gentlemen of the faculty who have practiſed in all quarters of the world, both

both in the army and navy, and have found the greateſt number had ſeen uſed, and been in the habits of uſing, emollient applications; ſome, linſeed-oil and lime-water; others, Goulard's water and ſaturnine applications: One phyſician told me an old woman uſed to be famous for curing burns, and that ſhe waſhed them with gin; another ſaid he had ſeen ſpirits of wine applied with great ſucceſs; but all, without exception, when they came to ſpeak of internal means of relief, always agreed in the cooling antiphlogiſtic method, with this reſerve, that they admitted the uſe of anodynes to mitigate the intolerable pain.

One of my chief motives for committing theſe obſervations to writing was the having facts to bring forward to ſhew the fallacy of theſe opinions, which have continued for ages, and might remain ſo for ages to come. Peculiar circumſtances have made me more attentive to this accident; and as opportunities do not happen frequently to individuals duly to appreciate many opinions, when facts do happen that give them an occaſion of detecting error, it becomes a ſacred duty to them to communicate ſuch obſervations to ſociety.

## CHAP. III.

*First Mode of Treatment.—The Progress of Medicine much retarded by Cures effected in slight Injuries—Severe ones best for ascertaining Truth.—Oily Applications externally universal in this Neighbourhood.—Complete debilitating Plan internally.—A Case* A. B.—*Death happened upon the ninth Day.*

FROM the very great variety of applications so strongly recommended by the first characters, an unbiassed individual would be at a loss on what to determine; and were we to add the miraculous cures performed by the nostrums of every village doctress, we should only add to his embarrassment. I presume one of the great causes of error is the assigning to various applications the cure of slight burns, some of which no doubt would have got well without any, and perhaps much sooner than with those which were used.—This mistake frequently happens from good motives, and by the best intentioned people; for if we have seen a person recover from any complaint during the use of any

any particular means, we naturally imagine ſuch beneficial effect to have ariſen from that cauſe, although, upon further inveſtigation, it may be found to have been inadequate.—There cannot be a more fruitful ſource of error than this; for the ſanguine and credulous have always facts to bring forward in ſupport of their favourite remedy; and, as they ſay, "There is no arguing againſt matter of fact:"—Surely not,—but what do ſuch facts prove?—Nothing more than this, that there are ſome perſons whoſe vital power is ſo ſtrong, that, with all the endeavours of officious ignorance, it cannot be overcome. This is the fruitful ſource from whence all quack medicines draw their ſupport: nothing is more eaſy than to have as many of theſe atteſted facts as you pleaſe; theſe facts beget dupes; theſe dupes beget knaves; and ſo the circle is formed. And the evil ſeems to have taken ſuch root in the country, that to exterminate them is beyond the power of individual efforts; but the evil is progreſſive, and when it becomes of a ſufficient magnitude, an enlightened legiſlature muſt relieve the country from ſuch a hydra. To avoid this ſource of deluſion, I purpoſe bringing into compariſon very ſevere caſes only, and ſome which muſt, in all probability, terminate in life or death, according to the different modes of treatment.—Such a view will at once do away all diſ-

truſt, and, I hope, give room for the eſtabliſhing of principles or laws which will be found unalterable, according to the preſent arrangement of the ſyſtem of Nature*.

It will not be neceſſary to apologize for any mode of practice, as all may be ſupported by high authority. I ſhall therefore begin with that which I learnt *en routinier*, and which, from enquiries, I find has been the practice of the firſt practitioners in this neighbourhood for a century back, and has been, and is at preſent, the mode purſued in the hoſpital here in reſpect to burns or ſcalds which accidentally happen.—The ſufferers, however, from that ſpecies of accident to which I principally allude, ſeldom or never go to the hoſpital, but are, in general, attended at their own houſes by the ſurgeon who attends the colliery. When ſent for to a patient who was burnt by an exploſion in a coal pit, the meſſenger, according to his report of the extent of the injury, was furniſhed with common green, or linſeed-oil, with

* As far as man is phyſically a part of that ſyſtem, it is his intereſt to know the laws, and his duty to obey them; for in every deviation from them, there is undoubted puniſhment according to the unlawfulneſs of the action. Thus it is a general law of Nature for fire to burn; ſo that if a man place himſelf, againſt his *own* law of ſelf-preſervation, in contact with fire, Nature will follow her law, and he in the inſtant is puniſhed for tranſgreſſing it.

with ceratum flavum, made ſofter with a greater quantity of oil, for the convenience of ſpreading, and lawn paper to ſpread the ſalve upon: When you arrived and examined the patient if there were any veſicles (or, as they term them, *bluſhes*) ariſen, you were immediately to ſnip them with the points of your ſciſſars, to let out the extravaſated lymph.—On the dexterous execution of this part of your buſineſs depended in a great meaſure your reputation with the patient and his attendants; when this was done, you anointed him well with the oil, which in general was applied by means of a few feathers they have taken care to pick up for you; the ointment was then ſpread pretty thick upon lawn paper, and cut in the moſt convenient manner to be applied to the different parts of the body which were injured, and afterwards kept upon the parts by bandages, if on the extremities; you then ſaw your patient put to bed, and left orders that, when the plaſters were dry, or he complained of great pain, they might raiſe the dreſſing, and anoint the pained part with oil.—To this order they paid due attention; for I have known in extenſive burns where the paroxyſms of pain have been ſevere, that above a gallon of oil has been applied in the courſe of four and twenty hours to one individual: When ſuch accidents happened in ſummer, ſuch a deluge as this cauſed upon the bed

and

and linen, and the heat of the weather tending to make it more rancid, gave riſe, in the courſe of a few days, to ſuch an effluvium as contaminated the air of the houſe.—This alone would have been a terrible ordeal for a delicate conſtitution to have gone through.—This mode was purſued until what they termed *the fire* was *killed*, when the oil was deſiſted from, and the ointment alone applied. This term of *killing the fire* means the period when the pain ceaſes, and the ſuppurative proceſs begins to take place;—this ſeldom happened until the fourth day, and the more ſevere the burn, the later this ſalutary proceſs begun: If it did not take place by the eighth day, the patient was exhauſted by the ſymptomatic fever; the irritated parts loſt their colour, the tumified parts ſuddenly fell, and ſpots of various hues on the burnt ſurface took place, from aſh colour to dark and livid, approaching to black; the face ſhrunk, the pulſe became tremulous, and a hiccup announced the approach of death, which happened always in five caſes I have ſeen upon the eighth day, or the ſucceeding night; this was the uniform progreſs of this complaint ſo treated externally.—Internally, the plan of cure was perfectly conſiſtent with the external means;—what is termed the antiphlogiſtic plan, which Van Swieten aſſerts in all caſes of burns muſt be ſtrictly attended to, was duly obſerved.—

ſerved.—Under the idea of the fire having got within him, (which is certainly poſſible to have been the caſe upon the ſurface of the lungs,) oily emulſions were given in large quantities, for the two or three firſt days, with an opiate at night;—if the fever ran high, cooling purges were given, with nitre powders, and *decoctum antiemeticum*, or ſome cooling febrifuge drinks: This was generally the courſe until the ſuppuration took place, and perhaps the day before the patient's death a cardiac julep might be ordered, at which time we well know he was out of the reach of medicine, as a mortification had then taken place. In thoſe caſes where recovery followed the above plan, the ſecretion of pus was very abundant, and it was very difficult to prevent the ſurface from putting on a looſe, gloſſy, fungous appearance, which required the uſe of aſtringents, ſuch as infuſion of roſes to waſh the part with; and if very obſtinate, ſtrong vitriol water, or any cauſtic application; the conſequence of which was very unſeemly and tender cicatrices. With a view of ſupporting the patient's ſtrength, as ſoon as the ſuppurative fever ceaſed, and the plentiful ſecretion of pus took place, he was ordered more nouriſhing food, and to take the bark, and if his circumſtances were adequate, he was permitted to indulge in a little port wine; but in general, an ale poſſet was

ſubſtituted,

ſubſtituted, as a ſtimulus more congenial to his former habits of living: As the pain ceaſed and his appetite increaſed, he indulged it to the utmoſt, ſuppoſing he was aſſiſting the intentions of his ſurgeon to ſupport his ſtrength: Thus I have ſeen a ſore of this kind become as it were a drain to the ſyſtem, and be almoſt as difficult to cure as an old ulcer.

Having thus drawn a conciſe general view of the manner of treatment I found in uſe in theſe caſes, I ſhall draw up one caſe which terminated unfavourably; and as there were very few changes of ſymptoms in the others which I ſaw, this may be looked upon as a deſcription of the whole.

## CASE.

A. B. a pitman, aged 30, was expoſed to the contact of the flame diſengaged from a collection of inflammable air (hydrogen gas) in a coal-pit in the neighbourhood of Newcaſtle in the year 1786: The dreſs he had on was a flannel waiſtcoat and drawers; theſe preſerved the parts which they covered, from the effects of the fire: Viewing him thus equipped, the parts which remained liable to the action of the flame were his face, neck, breaſt, arms, hands, legs, and feet; after examining him I found ſeveral veſicles formed on his legs and feet; theſe were cut with the points of a pair of

ſharp

ſharp ſciſſars, and then he was anointed with oil, and plaſters of yellow wax and oil, ſpread upon lawn paper, were then applied: When he was put to bed, upon inquiry how he felt when the fire left him, he ſaid he was in great pain, and had as violent a *ſhivering fit* as if he had been in the ague. It is not above two hours ſince the accident happened, and he has had three of theſe ſhivering fits. As his face is much burnt, there is reaſon to be apprehenſive that he may have inſpired ſome of the fire, and injured the ſurface of the lungs; the arms appear much burnt, for they have not ſhewn the re-action which ſlighter burns do, by quickly raiſing veſicles. He is ordered an oily emulſion, with a view of being of ſervice to the internal injury; and is to have an anodyne at night, with thirty drops of laudanum.

*Second day.*—Has paſſed a very reſtleſs night; very few intervals of eaſe, and thoſe only of ſhort duration; was frequently anointed with oil during the night; his pulſe 100, felt in the groin as the wriſts were burnt; on dreſſing him to day found ſome more veſicles on the legs, and ſome upon the neck and face; theſe were cut as the former; the extent of the burn is much more eaſily perceived to-day than yeſterday; the injured parts are now diſtinctly marked by their colour, which is a kind of dirty red, as if ſtained by port wine; this co-

lour

lour may partly proceed from ſome of the fine coal-duſt which inſinuates itſelf into the ſkin, and is difficult to be taken off: I have ſometimes tried to waſh it off with a fine rag and warm water; but if the injury has been conſiderable, the attachment between the cuticle and true ſkin is ſo much deſtroyed, that the cuticle is torn like wet paper, and expoſes the true ſkin in a moſt exquiſitely ſenſible ſtate: This attention to cleanlineſs muſt therefore be avoided. He is, as before, anointed and covered with plaſters; a doſe of purging ſalts is given, and the anodyne repeated.

*Third day.*—The ſalts had given him two ſtools, notwithſtanding which he paſſed another reſtleſs night; the arms feel tenſe; they are again dreſſed as before; ſome cooling powders are ordered with nitre, and ten drops of laudanum added to the anodyne.

*Fourth day.*—Pulſe 112; urine high-coloured; the arms are conſiderably tumified, and round the circumference of the injured parts of the arms an induration or thickening, ſomewhat raiſed, with an appearance of a freſh inflammation; more lively in its colour than that which was cauſed by the accident; emollient cataplaſms are to be applied to the arms; the medicines continued as yeſterday.

*Fifth day.*—Pulſe 120; urine the ſame; has had

had no evacuation by the bowels ſince he took the ſalts; is to have a purging enema, and other medicines as before; the inflammation, mentioned as taking place round the edges of the burnt places upon the arms yeſterday, ſtill continues, and is rather broader, being in ſome places near an inch in breadth; the higheſt colour where it joins the burn, and gradually ſhaded away to the natural colour of the parts, very much reſembles the inflammation ariſing from the efforts of the ſyſtem to throw off an eſchar formed by the application of a cauſtic. The other parts of the body continue much in the ſame ſituation, nor is there yet any appearance of pus.

*Sixth day.*—Pulſe 130; the glyſter procured a ſtool; was delirious during the night; tongue parched, and complains of a great thirſt; is to have a pint of *decoctum antiemeticum*, and his anodyne; the inflammation around the edges ſtill continues, and there are ſeveral aſh-coloured irregular ſpots in different parts of the arm where it was burnt; ſtill no appearance of pus in the legs, neck, or face.

*Seventh day.*—Pulſe 130; not ſo ſtrong as yeſterday; has been delirious during the greateſt part of the night, and appears at preſent in a comatoſe ſtate; has frequently a hiccup after drinking; and ſometimes his ſtomach rejects the fluids which

are

are given, (which conſiſt chiefly of tea, broth, or his medicines;) he is ordered a cardiac julep, and his anodyne: The aſh-coloured ſpots obſerved yeſterday are more numerous, and appear drier; the whole of the arms do not ſeem ſo much ſwollen, though the inflammation around the parts ſtill remains, but not of ſo bright a colour.

*Eighth day.*—Pulſe 130; very unſteady and ſmall, mouth much parched, and ſeems in a continued ſtupor; hiccup ſtill remains; the ſwelling of the ſurrounding parts has diſappeared, and alſo the inflammation; the whole of the burnt parts have a naſty brown colour, and the ſpots which were only aſh-coloured are now of a much deeper hue, reſembling thoſe of a mortification from any other cauſe; medicines as before.

*Ninth day.*—He continued in the ſtate of ſtupor as mentioned yeſterday, until early this morning, when he expired.

## CHAP. IV.

*Second Mode of Treatment.—The preſent ardor in ſearch of Truth is remarkable, and promiſes much.—John Hunter's merits as a Phyſiologiſt.—Obſervations on the Caſe* A. B.—*Caſe* C. D.—*Internal Treatment ſtimulant.—External, oily, or debilitating.—Life protracted to the twelfth day.—Caſe* E. F.—*Internal Means ſtimulating—External debilitating.—Life preſerved, but the Cure tedious, from too long continuance of the ſtimulant plan.*

IN the preceding ſection I have faithfully detailed the ſymptoms of a violent burn, which terminated in the death of the patient, between the eighth and ninth day.—I might have added four other caſes which I have ſeen treated, and ending in the ſame manner; but as they offered ſo little variety, I thought this one would ſhew the natural courſe of the complaint, under ſimilar circumſtances; and I have likewiſe confined myſelf to the moſt ſevere caſes, as from ſuch a method I hope a comparative view will tend to fix the attention of practitioners; by which means the ſubject may be

thoroughly inveſtigated, and the public at large will be benefited.

The opinions collected in the former part of the work will ſhew that the manner of treatment, particularly internally, was conformable to the advice and practice of the moſt orthodox in medicine and ſurgery. Perhaps, ſtrictly ſpeaking, the antiphlogiſtic plan was not carried ſo far as they would have recommended, for bleeding was not had recourſe to in all the caſes, although in one I knew ſo little what to do, from my own experience, that I followed the advice ſo ſtrongly inſiſted upon by the firſt authorities in medicine, and tried bleeding; it gave no relief, and certainly was of no uſe, as the patient died in the ſame manner as the others. It is in the internal treatment alone that we find a uniformity in the opinions of all: Their ideas of abating inflammation by reducing the powers of the ſyſtem; by bleeding, purging, and above all by a low diet, have acquired a ſanctity by age, and the habit of implicit obedience inculcated by the ſchools; but the liberality of the preſent æra may perhaps expoſe us to the hazard of an oppoſite extreme, as the mind juſt broken looſe from its fetters is hurried on to lengths it would not have gone, had it been originally cultivated with liberality. Theſe exceſſes, however, will be temporary, and the advantages will be permanent;

manent; for when men ſeriouſly, and without prejudice, ſeek after Truth, for her own ſake, there can be little doubt of their ſucceſs in finding her. The celebrated John Hunter has marked out one of the beſt methods for ſtudying the laws of the ſyſtem. With that acumen which ſo peculiarly marked his character, and that reſpectful attention to the powers of the ſyſtem which a knowledge of the laws of Nature inſpires, he has obſerved the peculiar healthy and diſeaſed actions of parts, and noted them in ſo clear a manner, that, ſhould the ſame method be followed by other individuals, we may hope, in time, to form a collection of pathological remarks, which will diſplay the whole power of our complicated ſyſtem.

The external mode of treatment was according to the orders of Van Swieten, in the caſes of irreſolvable burns, which theſe in certain parts undoubtedly were, particularly in the arms of the caſe above-mentioned, (though I believe other parts were reſolvable, although they were not reſolved, but of that afterwards:)—Certainly the external and internal means uſed were concordant with each other; for the bland, ſmooth, oily ſubſtances agreed perfectly with the cooling medicines: Thus one principle ſeemed to govern the whole, except in the emollient cataplaſms. This exception may appear extraordinary, for as far as

they were emollient they certainly claſſed in the ſame ſpecies; but as they are the beſt means we have of applying caloric or heat to any part of the body, in this view they will claſs under a very different ſpecies, namely, the ſtrongeſt ſtimulants.

In the caſe of A. B. we obſerve a great part of the body expoſed to the action of flame upon it; this, in ſome parts, as the legs, induced an immediate reaction with the formation of veſicles; but, from the fire acting more violently upon the arms, the organization of the parts was deſtroyed, which prevented their reaction, as they then became dead parts, no longer capable of fulfilling the functions which are aſſigned to them in health; juſt as parts deſtroyed by a cauſtic. From ſo rude an attack it became neceſſary to ſummon the whole ſyſtem; this we repeatedly find to be done in the ſhivering fits; and, in all injuries of this kind, when they are great, the ſame effects take place; and, according to the torpor previous to and during the ſhivering ſtage, the conſequent reaction of the ſyſtem will be more or leſs. Under this point of view the fever will appear a neceſſary effort of the ſyſtem to throw off theſe dead parts, and certainly will not require a debilitating plan, but every ſupport, until it is enabled to diſembarraſs itſelf, and reſtore the ſurface to its natural ſtate, that is, to the ſtate of a ſecreting ſurface;

face; for the ſkin in its healthy ſtate is both a ſecreting and abſorbing one, as is ſufficiently demonſtrated by various experiments. Thus we ſee the ſurface of a wound or ulcer performs the ſame functions as when covered by the ſkin; and the healing of ſuch diſeaſed ſecreting ſurfaces will very much depend upon the nice equilibrium maintained between the ſecreting and abſorbing proceſſes. We find that the ſyſtem was enabled to withſtand the violent irritative fever produced upon the immediate application of the injury; for when the patient dies from irritation, it happens before the fourth day, as I have had occaſion to ſee in three caſes: On the fourth day the ſuppurative fever ſeems to take place; the parts immediately in contact with the injured parts then begin to tumify, and an effort is raiſed to throw off theſe ſloughs, which if the ſyſtem is not able to accompliſh before the eighth day, it is overcome, and the patient dies of a real mortification; which appears from the aſh-coloured ſpots, and their becoming more livid before death. The ſudden diſappearance of the ſwelling, with the vomiting and hiccup, leave little room to doubt of this fact.—From viewing the diſeaſe under this aſpect, I was induced to treat the following caſes in the manner of a mortification ariſing from any other cauſe,

with reſpect to the internal mode, as I thought it would be more eaſy to overcome any objections that prejudice might form againſt medicines, than againſt the external applications, of which people in general think they are judges.

## CASE.

C. D. a pitman, aged 35, belonging to a colliery in the neighbourhood of Newcaſtle, in the latter end of the year 1790, was in the pit when an exploſion took place from his candle inflaming a quantity of hydrogen gas, which had been collected in that part of the pit, ſince he had worked there the day before: The dreſs he had on was a pair of flannel breeches, ſhoes and ſtockings, and a flannel waiſtcoat; this covering ſaved his lower limbs from being affected by the flame diſengaged in the combuſtion, ſo that only his face, neck and breaſt, hands and arms, were expoſed: From ſome of his companions ſaying he called out much while ſurrounded by the flames, there is reaſon to be afraid his lungs may be affected; after the fire left him he had a ſevere ſhivering fit, which was ſucceeded by intenſe pain; it is now an hour and a half ſince the accident happened, and he is trembling as if in an ague fit; he takes ſixty drops of laudanum immediately; as they ſuppoſe he is burnt in the inſide he muſt have ſomething oily; he

he therefore has an emulſion, in which an ounce of camphorated tincture of opium is put, and at night two grains of opium: The oil to anoint with, and the ſalve upon lawn paper, are applied as in the former caſe already ſtated.

*Second day.*—Has paſſed a very reſtleſs night, with great pain, notwithſtanding the large opiates; pulſe 100; has been profuſely anointed with oil, (a gallon uſed ſince yeſterday), the greateſt part of which is worſe than waſted, as it remains upon the bedding, and, with the heat of the patient and the atmoſphere, generates moſt noxious and offenſive odours; ſeveral veſicles about the neck near the roots of the hair; the hair itſelf on one ſide of the head nearly deſtroyed by the fire; this has ſaved the part underneath, as the ſcalp ſeems unhurt, and the adjoining ſkin only has ſuffered.—The extent of the injury is more plainly perceived to-day than it was at the firſt dreſſing; the different colour of the ſound and unſound parts is very eaſily diſcriminated, and the irritated parts have the ſame dull red from the fine coal duſt attached to the ſkin, as mentioned in the former caſe. Under the right arm and in the axilla the fire ſeems to have been particularly ſevere; as this had not the dark red colour, but was a brown, as if the fire had deprived it of life, and partly charred it, the parts were

dreſſed as before. Having ſeen the effects of the firſt mode of treatment, I had determined the firſt opportunity to try if an internal ſtimulant mode of treatment would be attended by more beneficial conſequences. I wiſhed therefore to begin early and before the patient's ſtrength was exhauſted, to ſee if I could get him beyond the fatal eighth day, and thus ſupport the ſyſtem to throw off the deep ſloughs, and afterwards aſſiſt it in the curative indications as ſymptoms required; with this intention he was ordered a drachm of bark, with half an ounce of the tincture of bark, and ten drops of laudanum, to be taken every two hours, and ſixty drops of laudanum in a cardiac draught at bed-time. According to this plan the diet was allowed at the time to be what it formerly was in the latter ſtages of the complaint, when the patient's ſtrength was wiſhed to be kept up, with the idea of ſupporting him under the profuſe ſecretion of pus, which always took place when the patients recovered by the former plan of cure: Thus he was allowed to have ale poſſet night and morning for his breakfaſt and ſupper, and any ſolid meat or ſtrong broths that he could take for dinner, with port-wine-negus for his common drink.

*Third day.*—Has been reſtleſs and uneaſy theſe four-and-twenty hours; his ſlumbers at night were

ſhort

ſhort and diſturbed; the appearance of the wounds much as yeſterday, except the right arm, which, though not much changed in appearance, is beginning to feel tenſe, as if a deep inflammation was about to take place; an emollient cataplaſm is applied, made with linſeed-oil and white bread; an ounce of laudanum was added to a quart of the oil; the bark, laudanum, &c. are continued as ordered yeſterday, and he is to have an anodyne to take to-morrow morning two hours before the time he is dreſſed, with ſixty drops of laudanum. Not having had relief by his bowels, he is to have a large purging glyſter.

*Fourth day.*—Pulſe 110; the glyſter procured a large evacuation; ſymptoms much the ſame as the day before; though he takes ſo much laudanum, does not appear to have ſo much ſtupor as thoſe I have ſeen before who only took it in ſmall quantities at night; he takes his medicines very well, and his generous diet rather with pleaſure than reluctance; the right arm rather more ſwollen, and the face puffed up about the eyes; continues the medicines as before.

*Fifth day.*—The ſwelling of the face and arm ſtill continues the ſame; the edges of the part deſcribed to be ſo much burnt in the axilla, extending itſelf to the integuments that cover the pectoral muſcle, and on the arm to thoſe which cover the

the inſertion of the deltoid, the ſuperior parts of the biceps muſcles are beginning to thicken, and a freſh line of inflammation forming round the part deſcribed; the emollient cataplaſm is continued to the arm, and the dreſſings as before to the burnt parts; the medicines continued as before.

*Sixth day.*—Pulſe 120; the appearance of the parts much the ſame as yeſterday; has had no evacuation by the bowels ſince the laſt enema; it is to be repeated immediately, and ſhould it not procure a ſtool, to be repeated at night; to prevent conſtipation, he is to have five grains of calomel and aloes, in pills, to take at bed-time; other remedies as before.

*Seventh day.*—He had the ſecond glyſter given him, which brought away ſome hardened fæces; the pills to be repeated at night, with the calomel and aloes; I avoid a liquid form of purge at this period, as I wiſh to keep the ſtomach free from any naufeating effect of medicine, as this is a critical period, having found all thoſe who ſunk under this accident to have gone off the eighth day or the night following; as he has taken his bark, the laudanum, and his generous diet hitherto without heſitation, it makes me more anxious to avoid offending his ſtomach, upon which ſo much appears to depend. There ſeems little alteration in the appearances to-day, except that the inflamma-

tion

tion round the great eſchar ſeems to have ſpread a little in its whole circumference, which, as it appears ſimilar to the inflammation ariſing on the original accident, gives riſe to an idea, formed by the friends of the patient, that the fire is not yet killed, though this ariſes from the ſeverity of the original accident, and is evidently an effort of the ſyſtem to throw off this dead part; yet of this it is difficult to convince them, the more ſo, as this is a fatal ſtage of the complaint, from which few recover.

*Eighth day.*—He has had a ſtool by the pills; continues his medicine; does not take his food ſo well as before, although his ſtomach has not yet rejected it after it is taken; is to have twenty drops of æther with each doſe of laudanum and bark, and half a dram in each of his anodynes; the parts appear much the ſame; the eſchar has not begun to ſeparate, nor do the other parts of the body which were burnt appear to have more moiſture than what ariſes from the dreſſings, ſo that there cannot be ſaid to be any pus ſecreted yet.

*Ninth day.*—Pulſe 125; urine high coloured; in other reſpects the ſame as yeſterday; there is yet no appearance of pus.

*Tenth day.*—In dreſſing him to-day ſome ſmall veſicles were upon the eſchar in the axilla, which,

upon

upon being punctured, emitted nothing but a little gas; this ſymptom is common in mortifications happening in different parts of the body, and convinced me that I was right in my conjecture of the patients in ſuch accidents dying under a real mortification if they ſurvived the eighth day; the ſkin beneath the cuticle where the veſicles were, is of an aſh-colour; the face is not ſo much ſwollen, tho' the inflammation continues around the eſchar, but no ſeparation of the ſkin between the original injured parts and thoſe excited into inflammation by their continuity, nor is there yet any pus; he objects to take his medicine ſo frequently as before, and has now and then a hiccup; has had no ſtool, therefore let him have five grains of calomel, and ten of aloes, in pills, at night.

*Eleventh day.*—Pulſe 135; has rejected his medicine twice, and once ſome food they gave him; the hiccup more frequent; the ſwelling of the arm has a good deal ſubſided, and the inflammation alſo; they are to give him as much wine as he will take; has a good deal of ſtupor.

*Twelfth day.*—Pulſe very ſmall, quick, and unſteady; has been comatoſe the laſt four-and-twenty hours; the ſwelling and inflammation of the parts entirely ſubſided; mouth very dry, and takes little; continued in this ſtate until the evening, when he ceaſed to breathe.

CASE.

## CASE.

E. F. a young man, aged 20, belonging to a colliery in the neighbourhood of Newcaſtle, was expoſed to the contact of flame diſengaged from the combuſtion of hydrogen gas, in the ſummer of 1791: The dreſs he had on was breeches and ſtockings, which ſaved his lower limbs; the whole of the upper part of the body was conſequently expoſed; ſays, he threw himſelf upon his face as ſoon as he found his ſituation, by which means the fore part of his body has not been ſo much injured as the back part, neither the mouth nor noſe being burnt: I had no doubt in my own mind of his having eſcaped any internal effect from this accident; this prevented me being obliged to accord with their prejudices, by giving him oily remedies internally, and, from the preceding caſe, it may be ſuppoſed I found the power a different mode had given me of continuing the exiſtence of my patient for at leaſt half the uſual period: I therefore loſt no time, but immediately begun the ſtimulant plan; he had 50 drops of laudanum in a cardiac draught given immediately, and to be repeated at night; a volatile julep, with *aq. menth. pip.* was ordered during the day, and the diet was allowed to be as good as he could take, with ſtrong negus for his drink; the external means were ſuch as

have

have been deſcribed in the former caſe; has had ſeveral ſhivering fits before he was dreſſed, and was trembling during the whole time of my viſit.

*Second day.*—Has paſſed a very reſtleſs night; had but few and ſhort intervals of eaſe; the parts injured are more marked than they were at firſt; a large portion of the breaſt and abdomen is much inflamed, and of a duſky red, from the ſmall coal-duſt; the left ſide and upper arm carry the ſame appearance; but the back, from the nape of the neck to the breeches waiſtband, has a much deeper colour, more inclining to a brown; he has the opiate repeated night and morning, and the julep continued, with the ſame diet.

*Third day.*—Pulſe 110; has had no evacuation by the bowels ſince the day of the accident; is to have a purging enema given directly; five grains of calomel to take at night, and his other medicines as before; the injured parts have changed little in appearance; the external means ſtill continued the ſame.

*Fourth day.*—Appearances much as yeſterday, except that the left arm is becoming a little tenſe and ſwollen; the ſame applications; the enema procured a ſtool yeſterday, and the calomel one to-day; is to take half a drachm of bark in an ounce and a half of decoction, and half an ounce of com-

pound

pound tincture of bark every three hours, and to continue the anodyne night and morning.

*Fifth day.*—Pulſe 120; urine high coloured; ſtill continues reſtleſs, and has conſiderable pain; the arm more tenſe than yeſterday; applications and medicines continued as before.

*Sixth day.*—No change in appearance or treatment.

*Seventh day.*—The plaſters taken from the breaſt ſeem rather more moiſt than they hitherto have done; the arm much the ſame; the edges of the burnt part upon the back beginning to thicken, (by this term I mean to ſwell and inflame) as is always obſerved around a part deſtroyed with a cauſtic, and denotes the neceſſary efforts of the ſyſtem to throw off the ſlough; medicines and external means the ſame.

*Eighth day.*—The moiſture which appeared upon the breaſt yeſterday, to-day carries evidently the marks of a laudable pus; the application of oil to this part as a liniment is deſiſted from; the inflammation of the arm and upon the back ſeems much the ſame; not having had a ſtool ſince that procured by the calomel, it is to be repeated; the other means continued as before.

I have thus continued my journal, thinking it neceſſary to give a daily account until the ſyſtem had taken on the ſecreting action upon the ſurface; having,

having, in all the caſes I have ſeen, deemed this a certain criterion of the future ſafety of the patient; beſides, it would be tedious, as well as uſeleſs to continue the journal in this caſe, as twelve months elapſed during the cure of the caſe I am relating: I ſhall therefore beg leave to continue the account, by giving a view of the ſymptoms and mode of treatment from this time to the cure.

Although a part of the injured ſurface was ſecreting, yet a very large part remained which was prevented from performing this function, by broad, deep eſchars upon the neck, ſhoulders, back, left ſide, and left arm. On the thirteenth day there was ſome appearance of the eſchar ſeparating in a ſmall portion on the lower edge of the left arm; and, in a few days more, pus was plentifully ſecreted; the thickening of the edges around the eſchars upon the back gradually took place; and about the twentieth, appearances of ſeparation in different parts; the throwing off ſuch broad deep ſloughs was a very tedious proceſs, and very diſtreſſing to the ſyſtem of the patient; as the ſlough became partly detached, the looſe parts were cut off; it was near three months before the laſt of the eſchars came away; it was placed upon the ſpinal proceſs of the ſcapula, and, from the ſlowneſs and difficulty of its detachment, ſeemed to include ſome of the tendinous fibres of the trapezius muſcle, which there

are there inſerted. The parts which, in compariſon, were only ſlightly injured upon the breaſt and abdomen, after they had begun to ſecrete pus, and the external treatment altered, that is, the oil deſiſted from, and the cerate, with lapis calaminaris uſed in its ſtead, ſoon put on a pleaſing aſpect and healed readily; but it was far otherwiſe with thoſe expoſed ſurfaces where the eſchars had been: They ſecreted an aſtoniſhing quantity of pus, and filled up with a looſe, ſpongy textured fungus, which obſtinately reſiſted the efforts to give them firmneſs. As this diſpoſition early ſhewed itſelf, that is, long before the ſloughs were ſeparated, the parts were waſhed with an infuſion of roſe leaves and lime-water, finely levigated lapis calaminaris was plentifully applied as an abſorbent, and dry lint covered with a plaſter ſpread with cerate; theſe being ineffectual, ſolutions of vitriolated zinc to the whole ſurface, and the ſtrong aqua cærulea to the edges were had recourſe to; by a continuance of ſuch means, varied according to circumſtances, the caſe terminated in the perfect cure of the patient in ſomething more than twelve months. In the dreſſings of ſuch ſores, for ſo long a time, however proper the applications may be, the parts become ſo accuſtomed to their uſe, that they ceaſe to cauſe the ſalutary effects which they produced upon their firſt application, ſo that it is neceſſary to chooſe a

variety of means, apparently the ſame, and when one ceaſes to act, take another, by which means, in ſo long a cure, the ſame application may ſeveral times be ſo managed as to excite a healthy action of the part.

Having thus far given an account of the external means uſed, and appearances as they occurred from the eighth day to the cure, I ſhall now mention the mode of conduct in regard to the internal treatment. It will be ſeen, from the journal, that I had the ſame view in treating this caſe, as in that of C. D. The ſtimulant plan ſo far ſucceeded as to aſtoniſh me in bringing the patient through the ſuppurative fever, as every ſymptom appeared more aggravated than ſeveral I had ſeen, whoſe ſyſtems by the antiphlogiſtic plan were unable to take up the action of ſecreting pus, and all evidently died with marked ſymptoms of local mortification: But, not content with having thus brought my patient through the moſt critical ſtage of his complaint, to a ſtate of comparative ſafety, I was induced, from an idea of the neceſſity of ſupporting him, to perſevere in the ſame means, although not in the extent, yet in a conſiderable degree; the irritation of ſo large a wound induced a continuance of the opiates, and the immenſe ſecretion of pus made me give him the cortex as a tonic; and, with a view of aſſiſting

theſe

theſe remedies, a nouriſhing full diet was allowed: Theſe means, I have ſince had cauſe to think, excited the ſyſtem to the extraordinary exertions, and hurried it on to that ſtate of permanent fever, which, in its appearance, much reſembled hectic. I do not mean, by this to ſay, that the whole train of ſymptoms might have been avoided; but I do not heſitate to confeſs that they might have been rendered infinitely milder, and of much ſhorter duration, by means I ſhall afterwards develope. During ſo long an attendance, and courſe of taking medicines, it was as neceſſary to change the remedies, that is, from one bark to another, and bitters, &c. as it was to change the external applications; notwithſtanding, by a continuance of ſuch means as I have above related, the caſe terminated favourably, and ſhews in a ſtrong point of view the utility, nay, I may go further, and ſay the neceſſity, of the early uſe of ſuch means.

## CHAP. V.

*Third Mode of Treatment.—Reflections on the Cases related above—Change of Treatment indicated, and at length eſtabliſhed upon the following Principles—Of Heat and Cold.—Nature of the Injury produced by Fire—What Remedies neceſſary, with their Mode of Action.—Diviſion of Burns—1ſt, Where the Action of the Part is only increaſed—2d, Where the Action of ſome Part is increaſed, and other Parts deſtroyed.—Treatment of the 1ſt Diviſion—Treatment of the 2d Diviſion.—Caſes* G. H.—I. K.—L. M.—*Mr Hopper.*

I HAVE already remarked that the termination of the firſt mode, in extreme caſes, which appeared evidently to take place from mortification, left me little room to doubt that this train of ſymptoms was the conſequence of general debility, from exceſs of ſtimulus at the moment of the accident, and a ſubſequent defect of it; and that the ſympathetic fever, which aroſe from the original irritation, exhauſted the powers of the ſyſtem, without obtaining the wiſhed-for end, which, in this caſe, ought to have been ſuppuration: And although the doctrines of all

all writers had inculcated the evacuant, cooling, antiphlogiſtic method to overcome the inflammation, the want of ſucceſs in this, and a contrary mode in other caſes of mortification ſucceeding, induced me to make an effort to ſupport the ſyſtem in the feveriſh ſtage of the diſeaſe; and the better to do this, I determined to begin early; for when the actions of life are ſunk to a certain degree, it is no eaſy matter to recall the ſyſtem back to her efforts. The extraordinary and wonderful effects of this trial are very apparent in the caſes in the ſecond mode of treatment. The firſt caſe is very ſtriking; for in that, we ſee the life of the patient ſuſtained to a period half, or a third as long again as his exiſtence would have been by the firſt mode of treatment. This caſe, though not ſo fortunate as the next to the individual, yet, as eſtabliſhing the principle, is more valuable to determine the practice; for of two perſons, both burnt ſo as to deſtroy their exiſtence, by the different modes of treatment the life of one was continued half as long again as the other; and the caſe of E. F. ſhews, that had the extent of the injury been a very ſlight degree leſs, what had prolonged his exiſtence in the one caſe, would have ſaved it in the other. I think it will appear extraordinary, that in a local injury, I ſhould firſt of all have attempted a change of the internal

treatment; but when the prejudices of the claſs of perſons to whom the treatment was applied is conſidered, it will be a ſufficient apology for a cautious change in what they were capable of diſcerning; the internal treatment was much more eaſily changed; a generous diet was more congenial to thoſe around them, they live well when well, and judge that what does them good when in health, can do them no harm when indiſpoſed, if they have the ability to take it; beſides, I now have no doubt that had I been induced at firſt to try topical applications of the claſs I ſhall preſently recommend, I ſhould have found ſo much benefit from them, as in a great meaſure to have ſuperſeded the uſe of active internal means, by which I ſhould not have been enabled to have drawn this parallel, and might have contented myſelf by having ſided with thoſe who recommended aſtringents, inſtead of thoſe who adviſed emollients. I therefore hope my errors may have their uſe; with this view I confeſs them.

It cannot be ſuppoſed but that when I found ſuch ſtriking benefit from this change of mode, it muſt have occaſioned great alteration in the whole train of my thoughts upon the ſubject. To attempt to trace the various ideas I had upon the ſubject, would be difficult to myſelf and tedious for my readers;—it will be ſufficient for me to obſerve,

ſerve, that what appears the leaſt abſtracted method of accounting for the phenomena will be the moſt deſirable; and, with this intention, I ſhall take the liberty of inveſtigating ſome of the moſt obvious effects of heat and cold.

## ON THE EFFECTS OF HEAT.

Before we proceed to deſcribe the third mode of treatment, it will be neceſſary to take a curſory view of ſome of the phenomena of heat, as far as our preſent knowledge of the ſubject enables us ſo to do: The common terms of hot or cold are ſo vague, that they hardly convey any preciſe idea, depending ſolely upon the ſenſation of the individual; and the ſame body may, at the ſame time, appear both hot and cold. Thus if a perſon juſt emerged from a cold bath at 40 degrees of Farenheit's thermometer, and another who has been ſome time in a hot bath at 112 degrees, ſhould both touch a piece of glaſs at 70 degrees of heat, they will give a very different account of their ſenſations; it will appear warm to the perſon coming out of the cold bath, and cold to him coming out of the hot one.—Independent of this fallacy of ſenſe, cold is generally eſteemed only a ſmaller degree of heat; as no ſuch thing has yet appeared as abſolute cold. Under this point of view, it will be neceſſary for me

firſt to inveſtigate the effects of the minimum of heat or cold, as by the contraſt, the effects of the maximum of heat will be the more evident: In this inveſtigation it will only be neceſſary to look at thoſe degrees of heat above and below the freezing point of the thermometer, which deſtroy the living principle of the ſubject ſubmitted to their action :—

*Firſt, of the effects of heat below the freezing point, commonly called the effects of cold.*

All animated nature is endowed with a ſelf-preſerving power, which, when aſſailed by noxious powers, acts according to the laws of the individual poſſeſſing it. Vegetables follow this law of ſelf-preſervation as well as animals; they bear the want of heat ſeveral degrees below the freezing point; but if the heat is ſuddenly abſtracted after wet weather, or a thaw, the fluids contained in their veſſels loſe their individual power, and follow the laws of inanimate matter in reſpect to congelation with a lowered temperature. Thus, in ſevere winters, a great number of plants and trees are killed; the latter are ſometimes ſplit with a conſiderable report. Animals poſſeſs this power of ſelf-preſervation in a greater degree; in ſome of the lower orders of animality, as in the earth-worm, it exiſts when the ſurrounding medium is conſiderably leſs than

than 32 degrees of Farenheit's ſcale, although the heat of the worm itſelf did not ſink below that point; but if the heat be ſuddenly diminiſhed by keeping itſelf at the freezing point for ſome time, it exhauſts its power of life, which, when done, it immediately takes on the temperature of the ſurrounding medium. The more perfect the animal becomes, the greater his powers; and, although man does not ſeem ſo well defended by nature as ſome other animals, yet, when we behold the advantages he has already drawn from experience, and the progreſſive ſtate he is in with reſpect to the improvement of ſocial intercourſe, and the power of baniſhing unpleaſant ſenſations by various contrivances, he has no reaſon to envy the fleecy covering of the ſheep, nor the warm fur of the fox. But, notwithſtanding thoſe aids which man from his experience is enabled to procure, he is ſometimes ſo circumſtanced as to be expoſed to a ſudden diminution of heat; this happens moſt frequently in Siberia in Aſia, in Switzerland in Europe, and in Canada in America. There are inſtances recorded that ſome of the conquerors of the new world, in the beginning of the ſixteenth century, rather than take a circuitous march round the mountains of Peru to ſearch for thoſe mines which their inſatiable avarice prompted them to ſeek, attempted

tempted to croſs over the mountain of Antiſona, where neither their thirſt for gold, nor all the paſſions it inſpired, could prevent their ſuffering from want of heat, which fixed and preſerved them in the very place and attitude they were in when they ſuffered ;—they were found above a century afterwards in this ſtate, and may be regarded as natural mummies.

Travellers in Switzerland are ſometimes attacked, particularly on horſeback, with a great deſire to ſleep ; if they do not oppoſe this, they ſoon fall a ſacrifice to the univerſal torpor.—This mode of dying does not appear from the relation of thoſe who have eſcaped it to be painful; the ſurface of the body is that part which loſes its motion or life the firſt. In Canada, when a traveller is thus ſeized, and appears to be dead, his companions bury him in the ſnow for the night, and on the following morning he is generally found in ſuch a ſituation as to be enabled to purſue his journey; but if he appears ſlow in coming to himſelf, they throw a little warm litter about him, which being ſome degrees warmer than the freezing point, cauſes an appearance of a gentle thaw, which is found a ſufficient ſtimulus to excite the ſuſpended functions of life These are the effects of a low degree of heat when long continued :—It is not uncommon in countries where, during a great part of the year, the heat is much diminiſhed,

diminiſhed, to ſee people who have loſt a part of their noſe or their ears from this cauſe.

That great philoſophic phyſiologiſt, John Hunter, obſerves that in the year 1776, the combs of his cocks in the country were ſmooth, with an even edge, and not half ſo broad as they formerly were, appearing as if one half of them had been cut off;—inquiring into the cauſe, he was informed by his ſervant that it had been common in the country during the hard froſt, for part of the combs to become dead, and then to drop off. Mr Hunter imputed this to the froſt which had frozen the part and deprived it of life, when conſequently it dropt off: He endeavoured to prove this idea by experiment, and attempted to freeze the comb of a young cock, by putting it into a mixture of ſalt and ice, which ſtood at o of the thermometer; the comb itſelf was thick and large, and reſiſted the being frozen; but the ſerrated edges of the comb, which were half an inch long, were perfectly frozen; they were white and hard, and when a piece was cut off it did not bleed, nor did the animal ſhew any ſenſe of pain: He next introduced into the freezing mixture one of his wattles, which was very broad and thin; this froze readily; on thawing the comb and wattle, they became warm, but were of a purple colour, having loſt the tranſparency which remained in the other wattle; the wound in the comb

comb now bled freely: It was near a month before the parts frozen were well, and returned to their natural colour; this they did neareſt to the ſound parts firſt, and ſo on gradually, until they were of their uſual appearance. Mr Hunter alſo froze the ears of rabbits in the freezing mixture; they became hard and ſtiff, and, when cut with a pair of ſciſſars, flew from between the blades like a piece of hard chip; when thawed, they began to bleed, and were very flaccid, ſo as to double upon themſelves, having loſt their natural elaſticity. When out of the mixture about an hour they became warm, which increaſed to a conſiderable degree; they alſo began to thicken from inflammation, and retained the warmth for ſeveral days.

From theſe experiments of Mr Hunter, it appears that the action of the parts is ſuſpended; for when the comb of the cock or the ear of the rabbit was cut, there was no appearance of circulation, and there was no bleeding. This ſuſpenſion of action in a part of the ſyſtem is by proper care to be recovered. When this happens to people in Canada, for inſtance in the hands or feet, they reſtore the action by rubbing ſnow upon the part, as ſnow is warmer than the atmoſphere they were expoſed to; then the coldeſt water is applied, and to this there is the additional ſtimulus of friction, as poſſeſſing

ſtill

ſtill more degrees of heat than ſnow; and by thus gradually reſtoring the action of the part by increaſing the ſtimulus of heat gradually, and waiting till the part has taken on the action neceſſary to the degree of ſtimulus applied, the parts thus affected may be recovered.

But if this is not attended to, and the proportion of heat ſhould be too great, the part will be thrown into inordinate action; and as its powers are ſo much reduced, they are ſoon exhauſted, and the part mortifies.

After reviewing the phenomena which take place in the diſeaſe termed *froſt-bitten*, we ſee it depends upon a ceſſation of action of the veſſels of the part, from a deficiency of the ſtimulus of heat. The mode of relief in this accident is, by cautiouſly and very gradually reſtoring the action of the part, by ſmall additions of temperature, until it can bear the accuſtomed heat, and take up the action of the veſſels to which it is attached; thus reſtoring the ſyſtem to its unity of action. Should internal means be neceſſary, they will be ſuch as diminiſh action; for if the action of the heart and arteries ſhould be increaſed by ſtimulating the ſtomach, the diſeaſe will be increaſed, as whatever augments the diſparity of action between the ſyſtem and the part is noxious, for on the reſtoration of the equality of action depends the cure; therefore the

mode

mode of cure will be to increaſe the action of the part by a greater quantity of heat, and to diminiſh the action of the ſyſtem to meet the reduced action of the part, ſo as to form a whole again: If this is not nicely attended to, a ſolution of continuity of action takes place; the part, being no longer a conductor of the circulating powers of the ſyſtem, becomes a dead body, and requires a proceſs of the ſyſtem in order to be ſeparated from it, as in any other caſe of mortification ariſing from any other cauſe.—From this I think the following law may be eſtabliſhed, namely, WHENEVER THE ACTION OF A PART HAS BEEN CONSIDERABLY DIMINISHED BY WITHHOLDING AN ACCUSTOMED STIMULUS, THE REAPPLICATION OF THE STIMULUS SO WITHHELD, (OR ANY OTHER WITH A VIEW TO MAKE UP FOR THE DEFICIENCY) MUST BE VERY CAUTIOUSLY ADMINISTERED, UNTIL THE PART IS GRADUALLY RESTORED TO ITS FORMER HEALTHY ACTION.

*2dly, Of the effects of heat above the freezing point, carried to the extent of what is termed burning.*

It appears that according to the perfection of the powers of life, the preſerving powers are equally delegated: From inveſtigation we have found the power of reſiſting a diminution of heat; and the experiments of Meſſrs Blagden, Solander, and Banks, ſhew

ſhew we equally poſſeſs the power of retaining our exiſtence under very high degrees of heat; even to 260 degrees of the thermometer, which we may term the powers of reſiſting an increaſe of heat.

The Abbé Chappe informs us that the Ruſſians paſs hours in their vapour baths at the increaſed temperature of 160 degrees, from whence they immediately plunge into the cold ſtream, and not only with impunity, but with the moſt beneficial effects, both in the cure and prevention of diſeaſes. But it is not our intention at preſent to point out the reaction of the ſyſtem from temporary variations of temperature, but to ſhew the *primary* effects of a ſudden ſubtraction or addition of heat, upon the ſyſtem, with a view of pointing out a rational cure. From a diminiſhed temperature, the diminution, and alſo the ſuſpenſion of action and circulation, ſeem ſufficiently proved from Mr Hunter's experiments on the comb of the cock and the ear of the rabbit.

With a view of ſhewing the effect of heat upon the circulation of the blood, I went into a vapour bath when my blood was going at 60 ſtrokes in the minute; the range of the thermometer while I was in the bath was from 100 to 116; after having been in a few minutes my pulſe gradually began to riſe, and when I had been there near twenty minutes, it beat at 130 ſtrokes in the minute.

nute. From repeated trials of this experiment, I cannot hesitate in concluding that one of the most obvious effects of heat is to increase action; which, if moderately and generally applied, is conveyed to the whole system; but if the action is sudden and great, the vessels themselves are destroyed as organs before they can take on the action, and communicate it to the rest of the system. Thus do the ends of vessels, which a few moments before had functions to perform, become inert and dead bodies, attached to living parts of the same vessels, which from this moment require a process of the system to throw them off, and restore itself to its functions, viz. to those of a secreting and absorbing surface, which the skin evidently is in its healthy state: But there are very various degrees between a slight increased local action and a destruction of the part itself; probably there seldom or never happens an accident where a part can be so totally destroyed, but that other parts will only come within the limits of an increased local action.

From this view, injuries caused by a pernicious quantity of heat suddenly applied to a part of the body, may be termed *local injuries from increased action;* the mode of relief in this dreadful accident will be thus indicated in order to restore the unity of action; 1st, By gradually diminishing the excitement or action of the part; and 2dly, By increasing

fing the action of the ſyſtem to meet the increaſed action of the part, holding this law of the ſyſtem in view, THAT ANY PART OF THE SYSTEM HAVING ITS ACTION INCREASED TO A VERY HIGH DEGREE, MUST CONTINUE TO BE EXCITED, THOUGH IN A LESS DEGREE, EITHER BY THE STIMULUS WHICH CAUSED THE INCREASED ACTION, OR SOME OTHER HAVING THE NEAREST SIMILARITY TO IT, UNTIL BY DEGREES THE EXTRAORDINARY ACTION SUBSIDES INTO THE HEALTHY ACTION OF THE PART.

With this view, holding the part to the fire, ſeems the beſt mode of relief; but as parts of the body are injured where this cannot be done, the moſt ſtimulant applications muſt be had recourſe to, for in this claſs there is little fear of any of them being greater than that which originally cauſed the accident; the ſtrongeſt rectified ſpirits, made ſtill ſtronger by eſſential oils; add to which, they may be heated as much as can be ſuffered on the ſound parts; theſe, and many more applications of the ſame claſs, will give the ſpeedieſt and moſt effectual relief: Theſe are only to be continued for a certain time, otherwiſe they may afterwards cauſe the very ill they were given to cure, and then to be ſucceeded by leſs ſtimulant applications, until the parts act by the common natural ſtimuli.

The internal mode of relief will be to give thoſe ſubſtances which ſooneſt excite the ſyſtem to great action, ſuch as æther, ardent ſpirits, opium, wine, &c. by which means the ſolution of continuity of action is allowed to continue the ſhorteſt time poſſible, and the unity of action reſtored, which conſtitutes the cure. The propriety of practiſing from theſe principles, I hope will be ſufficiently illuſtrated in the third mode of treatment.

If the foregoing views of the effects of heat are admitted, the following will be the law from which the practice in the treatment of burns muſt be drawn, THAT ANY PART OF THE SYSTEM HAVING ITS ACTION INCREASED TO A VERY HIGH DEGREE, MUST CONTINUE TO BE EXCITED, ALTHOUGH IN A LESS DEGREE, EITHER BY THE STIMULUS WHICH EXCITED THE INCREASED ACTION, OR SOME OTHER HAVING THE NEAREST SIMILARITY TO IT, UNTIL, BY DEGREES, THE EXTRAORDINARY ACTION SUBSIDES INTO THE HEALTHY ACTION OF THE PART. Let us for a moment reflect upon the agent which has increaſed the evil,—diſengaged caloric, the moſt violent and active of all known ſtimuli: If this is the caſe, we muſt look for ſome of the ſtrongeſt ſtimuli, and the nearer we get to the one which cauſed the injury, it is the beſt for the inſtant, though even ſhould that be con-

continued too long, it of itſelf might be injurious. Suppoſe, for inſtance, we apply the ſtrongeſt alcohol at firſt, and, to render it more efficacious, it ſhould be heated to what the ſound part would bear without injury; afterwards it ſhould be gradually diluted until it comes to proof ſpirit, and the heat diminiſhed, although that gradually, as cold is always pernicious, bringing on that tendency to ſhiver, which ſhould ever be cautiouſly guarded againſt, as being a moſt pernicious ſymptom, and the forerunner of a violent ſympathetic fever: With a view to prevent which, external heat ſhould be kept at a high temperature, and the action of the whole ſyſtem excited to as great a degree as the ſafety of the ſubject will admit of. By this means you make the action of the whole meet the increaſed action of the part; by which, the leſſening of the increaſed action of the part to join the action of the whole, is rendered more eaſy: Thus there is a unity of intention by both the external and internal means, which leads to the reſtoration of the unity of action, and thus is the cure performed. It will be ſaid that is only the caſe when there is an increaſed action; but when the parts are deſtroyed, other means ſhould be uſed, ſuch as emollients, &c.

Some have divided burns into ſeveral ſpecies,—but I ſhall content myſelf with dividing them into two:—1*ſt*, *Thoſe where the action of a part is only*

*increaſed.—2dly, Thoſe where ſome parts have increaſed action, and other parts are deſtroyed.*

In parts that are totally deſtroyed, it is of little conſequence what is applied to the dead part, as the throwing off an eſchar depends upon the action of parts which remain alive, and not upon what is applied to thoſe which are dead. But I muſt own I never ſaw an inſtance of a burn where, though ſome parts were totally deſtroyed, there were not, always, other parts where there was only increaſed action. Now, as our duty is always to ſave living parts, our mode of cure in the firſt inſtance will be always the ſame, that is, to ſave the parts which have only an increaſed action; in the doing of which, the dead parts will not be the worſe, for the ſeparation of them is a proceſs of the ſyſtem which requires time, and if the injury is to any extent, draws forth the joint efforts of the ſyſtem, and even calls up all the energy of its powers to violent fever; which, from the obſervations in the ſecond mode of treatment, it requires every artificial aid to ſupport, to bring the parts to ſuppuration, otherwiſe the ſubject falls in the conteſt; for if the living parts have not the power to throw off the dead, the dead will aſſimilate the living to themſelves, and a mortification enſue.

When the living parts have been preſerved, which according to this treatment will be in the courſe

courſe of two or three days, the dead parts will be more plainly obſerved, and the beginning of the proceſs to throw them off will be commencing. This proceſs, as has been ſhewn in the ſecond mode of treatment, muſt be aſſiſted by keeping up the powers of the ſyſtem againſt debility; by ſtimulant medicines, and a generous diet: The eſchars will be much aided in coming away by the application of the ſtimulus of heat, by means of cataplaſms frequently renewed;—they may be made of milk and bread, and ſome camphorated ſpirit, or any eſſential oil ſprinkled upon the ſurface: Theſe means need only be continued until the ſuppuration is eſtabliſhed, as then a different mode muſt be purſued.

I mentioned in a former part of the Eſſay, that when ſuppuration had taken place, it was the cuſtom to allow the patient a better diet, and to give more ſtimulant medicines under the idea of ſupporting the ſyſtem under the great ſecretion of pus, which in general took place if the accident had been ſevere. In the caſe of E. F. this mode was adopted. The ſubject of this caſe was above a year before he was cured; though I muſt own the caſe, from the great ſloughs that were thrown off, was the worſt I ever ſaw; and we find in ſome of the caſes related of ſcalds of the legs, that above eighteen months elapſed before they were healed.

Having found the former parts of the practice wrong, I began to doubt of this alſo, and determined the firſt opportunity to convince myſelf of the propriety of this mode. It was not long before I had a favourable caſe for the experiment; accordingly after I had ſupported the ſyſtem to a ſuppuration, I then gradually deſiſted from my ſtimulant plan, and was aſtoniſhed to find that a diminiſhed ſecretion of pus was the conſequence, and the healing proceſs wonderfully quickened. This is clear in the following caſe of I. K. for that caſe was finiſhed with bleeding and purging, which uſed to be the beginning of others.

From this view, it would appear that the ſyſtem during the time of ſuppuration had formerly been diſtreſſed with a too abundant quantity of food and ſtimulus, and had been at the pains of aſſimilating that which was obliged to be thrown off as an excrement; the ſyſtem thus excited took up the action of hectic, as in the caſe of E. F. who had flushings after eating, and exacerbations in the afternoon: Though theſe ſymptoms left him as the wounds healed, there is no doubt of their being very much increaſed, if not entirely cauſed, by the improper method of cure.

Thus we ſee the whole of the former treatment inverted; the moſt gentle ſoothing means were uſed both externally and internally, when an acci-

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dent of this terrible nature happened; theſe were continued until ſuppuration took place, and then the ſyſtem was excited under an idea of ſupporting it, which not unfrequently ſo fatigued the ſyſtem, as induced a fever of the hectic form. The preſent mode is the reverſe of this; when a part of the frame has been much excited, this part is not allowed to ceaſe to act for want of ſtimulus, but is kept in action by an adequate ſtimulus, gradually diminiſhing it until it returns to its ordinary action: With the ſame view the internal means are highly ſtimulant to the whole ſyſtem, which muſt be ſuppoſed to be in a natural ſtate at the time of the accident. Thus increaſing the action of the whole generally, by ſtrong ſtimuli, and decreaſing the action of the part by leſſening the ſtimuli, the deſired end will be more readily obtained, that is, the equilibrium of the action will be reſtored. Should the injury have gone the length of deſtroying any part of the body, I have obſerved that this cannot take place without ſome other parts of the ſyſtem only having their action increaſed. The reſtoration of thoſe yet living parts muſt be firſt attended to; and this very mode will facilitate the proceſs of throwing off the dead parts, which, when done, and a ſuppuration having taken place, the exciting of the ſyſtem by any thing ſti-

mulant, either by food or medicine, ſhould be cautiouſly avoided. Should the ſecretion of pus continue too great, gentle laxatives, and a ſpare diet are indicated: If any part, as the eyes for inſtance, keep weak, with a tendency to inflammation, topical bleedings, or ſmall quantities of blood taken from the arm, are uſeful: To defend the new ſkin, camphorated oil, or camphorated oil and lime-water, equal parts, are very good topical applications. Wounds of this kind heal very faſt when the diminution of pus is prevented, by attention to the diet: If it is neceſſary to keep up the patient's ſtrength, ſmall doſes of bark, taken two or three times a day in ſome milk, will anſwer that purpoſe, and will not excite a quickened circulation, as wine, ale, or ſpirit is too apt to do.

By attention to theſe general principles, I can truly aſſert, that I have cured very many extenſive and dangerous burns and ſcalds, in one, two, three, and four weeks, that by the former method would have taken as many months; and ſome which I believe to have been incurable by the former method.

It muſt be ſuppoſed that before I had determined all theſe points in my own mind, I have had a conſiderable opportunity of appreciating the juſt value of ſeveral applications from repeated and numerous trials. At the ſame time, when I point

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out what I believe to be the beſt, I by no means purpoſe to ſay that it cannot be exceeded, but only that it has ſo far exceeded what I had been accuſtomed to, as to aſtoniſh me. The principles however are, I hope, clearly laid down; every ſcientific man will therefore have an opportunity of chooſing for himſelf.

When ſpeaking of the application of *oil* externally, to burns, I mean olive-oil, rape-oil, linſeed-oil, and, in general, all oils which are obtained by preſſure from any of the emulſive ſeeds, or kernels of vegetables. The great degree of ſmoothneſs they poſſeſs, and their being void of every irritating quality when applied to a ſound part of the ſkin, appears to have been the great motive of their uſe. There certainly are caſes where the cuticle receives benefit from their uſe: By filling up the pores they prevent abſorption:* But this very quantity which has its uſe in other caſes is one of the chief cauſes why it is detrimental in this; for the ſecreting, or exhalent veſſels of the ſurface being greatly excited, the abſorbents ought to be urged to an equal action, or the conſequence is the extravaſation of ſerum under

* With this view Mr Hunter recommended them to his aſſiſtants, when diſſecting, to apply over the ſurface of their fingers to prevent the abſorption of animal poiſons.

der the cuticle, which forms the bliſters; inſtead therefore of a medium that leſſens or prevents an increaſed action of the abſorbents, it ſhould be avoided as pernicious.

With this view theoretically, I would ſay oil is perhaps the worſt of all applications, as it has been practically proved in the caſes of the firſt and ſecond mode of treatment. *Opium diſſolved in oil* I frequently tried, but I muſt confeſs I never found any other effects than from oil with itſelf: I am therefore obliged, from experience, to claſs it with oil, although I have heard ſeveral practitioners ſpeak highly of its great efficacy. *Lime-water*, mixed with any of theſe oils, but chiefly with *linſeed-oil*, is an application held in very great eſteem in ſeveral hoſpitals in England, and is in uſe in moſt parts of Europe;—it forms an elegant ſaponaceous liniment, and is certainly preferable to oil alone. On account of its conſiſtence, and if continued during the curative proceſs, it prevents in ſome degree the immoderate ſecretion of pus, which the too great uſe of oil encourages; but as an application to be uſed in the firſt inſtance, it is very inadequate to produce any beneficial effect. The great repute this application poſſeſſes, ſeems to ariſe from its being contraſted with common oil; but I am led to believe this cauſe has ranked

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it higher than it merits. *Goulard's water* has been very much boaſted of, and is a very general application both in this and other accidents; but it is employed with very little diſcrimination. This, though a weak preparation of lead, partakes in a ſmall degree of the general properties of that mineral. John Hunter thinks it leſſens the power more than the action; if therefore to this is added the cold water as its vehicle, the action will be likewiſe leſſened, ſo that it combines both the debilitating properties of decreaſing power and action. Viewed in this light, it is highly improper, and very inadequate to any uſeful purpoſe, as I have experienced. It is likewiſe in direct oppoſition to the principle. Goulard's *cerate* is a better application than the mere wax and oil which was formerly uſed, and if continued during the whole of the cure, becomes a very uſeful application, and ranks above the linſeed-oil and lime-water; but if the ſurface injured ſhould be large, I have ſeen bad effects from its uſe, particularly in children, therefore the *unguentum é lapide calaminari* ſhould have the preference.

Having been anxious to procure the opinions of practitioners upon this ſubject, wherever it might have been a ſubject of thought or practice, when upon the continent, I converſed with ſtudents from

from all the countries in Europe upon the treatment of accidents of this kind; in general they agreed in the Boerhaavian treatment already deſcribed; but at Paris I found Monſ. Le Sage had recommended the uſe of the *fluor volatile alcali*, which was ſpoken of in high terms: From ſeveral trials by men of eminence, it was certainly worthy of more general uſe: The mode in which it was applied was as follows:—Cloths moiſtened with it were applied to the injured part, and renewed as often as dry until the pain vaniſhed, when the part was ſaid to be well. From this account I can only ſuppoſe it had been uſed in ſlight caſes, otherwiſe the above deſcription could not have been accurate; for the ſuppurative proceſs muſt have required a very different treatment. I have employed the fluor volatile alcali myſelf with conſiderable benefit, but not in the manner above deſcribed, but as follows;—the parts were waſhed with a wet rag, or an armed probe, well moiſtened with the liquid; afterwards a plaſter of a good ſtrong digeſtive ointment, compoſed of yellow baſilicon rendered to the conſiſtence of a liniment, by the addition of ſpirit of turpentine: By theſe means a great portion of the inflamed ſurface was cured, if I may be allowed ſo to expreſs it, by the firſt intention, and the parts more injured were ſoon brought

brought to a ſuppuration, and the cure conſiderably haſtened. I had no occaſion to repeat the application of the waſh more than twice or thrice; this was done at each dreſſing, which was at the interval of twenty-four hours. I do not therefore heſitate to recommend in ſtrong terms the uſe of this as I uſed it, or a trial of it as recommended by Monſ. Le Sage: In ſlight caſes I make no doubt but it would anſwer. Monſ. Fourcroy, in his lectures at the Lyceum in Paris, recommends it, and ſuppoſes it may act by combining with, and carrying off, ſome of the diſengaged matter of heat which had not had time to combine with the part, by which means the parts are prevented from being diſorganized by its further action. Monſ. Chaptal ſeems to be of the ſame opinion. This explanation favours the opinion of fire being a body, although moſt probably it is only an effect; but that is of no conſequence; if the application produces beneficial effect, it is ſufficient for the ſufferer.

In this trial I muſt not give the whole of the merit to the fluor volatile alcali, as the mode of applying the digeſtive will have a powerful influence; as I ſhall attempt to ſhew in appreciating the value of ſpirit of turpentine. From the component parts of *æther*, from its quick and ſtrong action upon the ſtomach, and from the great

great excitement it cauſes over the whole ſyſtem, I was led to believe it would be of uſe externally in ſuch caſes. With this view I made ſome trials upon trifling accidents, and uſed it in the ſame manner as I deſcribed the uſe of the fluor volatile alcali; but in a more extenſive accident, its uſe appeared leſs beneficial, and this appeared chiefly to ariſe from its quick evaporation, inducing that tendency to excite torpor on the part, and that *general ſhivering* which I have always found in caſes of magnitude; this diſadvantage was ſufficient to make me deſiſt from the external uſe of it; as I have been induced, in the multitude of caſes I have ſeen, to draw favourable or unfavourable inferences, according to the degree of this untoward ſymptom. From the experience of this effect of æther, I am rendered the more doubtful in accepting the explanation of the action of the volatile alcali, as mentioned by the French chymiſts; for this very property produces a prejudicial effect, when carried to ſo great a degree as æther is capable of doing.

*Alcohol.*—It is the greater or leſſer quantity of this principle that varies the ſtrength of all fermented liquors, for when they are ſubmitted to diſtillation, this principle being more volatile, ſeparates from the others in the ſtill, and comes over as an ardent ſpirit, which, by repeated diſtillation

and

and rectification, is deprived of all the watery and other caſual combinations, and becomes ſpirit of wine, or what is termed by the Arabian chymiſts, *alcohol;* a name which the framers of the new chymical nomenclature have choſen to retain. As a great number of ſubſtances had been recommended, ſuch as brandy, gin, &c. &c. which all contained this principle in different degrees; and as I believed that their efficacy aroſe chiefly as it abounded, I made trials with it of different ſtrength, diluting it with diſtilled water when I wanted to weaken it; but, from experience, I am confident of its greater efficacy when pure. This fact did not eſcape that moſt attentive and honourable recorder of medical truths, I need ſcarcely mention the name of Sydenham; he ſtrongly recommends it in all which are denominated reſolvable inflammations. I have ſeen the moſt happy effects from the uſe of this in the ſame manner as I uſed the fluor volatile alcali, and afterwards the ſame digeſtive as I then pointed out. From the known property of this ſubſtance to increaſe action, as well as ſeveral of thoſe whoſe effects I am now relating, and from the general idea of their being the ſtrongeſt ſtimulants we are poſſeſſed of, I muſt requeſt the reader to keep in mind the ſtimulus which occaſioned the injury, as in that ſcale, if ſuch a denomination is admiſſible, they will be termed *ſedatives;*

*tives;* or, as Dr Darwin names a claſs, *torpentia*, or applications that leſſen action.

From the effects of alcohol, it ſtands very high in my eſtimation in ſuch caſes; and no doubt any ſubſtance containing much of this principle, will produce beneficial effects in ſome ſtages of the accident. Camphor adds to its efficacy if care is taken immediately to cover the parts with a cloth ſmeared with an ointment; this precaution is neceſſary for theſe reaſons; it prevents evaporation, conſequently the unpleaſant ſymptoms attending that proceſs already mentioned; and, by continuing the ſpirit and camphor on the ſurface, the abſorbents are excited to action, and take it up, together with part of the ſerum which is brought to the ſurface, by the increaſed action of the exhalents from the ſtimulus of the caloric. Thus the balance of the ſecretion and abſorption is kept up, and the increaſed actions of both are gradually allowed to ſubſide.

*Spirit of turpentine* is obtained from the diſtillation of common turpentine; it is regarded as an eſſential oil, but has this peculiarity, of being immiſcible with the alcohol of the ſhops;* it has a peculiar ſtrong ſmell, and an acrid pungent taſte. A very few drops taken internally, with ſome conſtitutions,

* Chaptal ſays *pure* alcohol combines with it.

ſtitutions, produce a moſt violent effect upon the urinary paſſages, for which reaſon it is ſeldom ordered for internal uſe. When applied externally, it powerfully excites the abſorbents of the part. As a proof of this, a few hours after its application upon any part of the external ſurface of the body, the urine will be highly impregnated with its odour. As this is a fact I wiſhed to be perfectly clear in ſtating, I have repeated it upon myſelf and others, and now aſſert it without heſitation. Many other ſubſtances may both poſſeſs and exert the ſame power, but as they are not ſo obvious to our ſenſes, ſuch effects can at moſt be only hypothetical: It is principally from this ſenſible power of its action that I am induced to infer a great part of the very conſiderable benefit ariſing from its uſe in accidents of this nature. We have already ſeen that one of the principal effects of heat applied to the ſurface, is to increaſe the action of the exhalant veſſels and cauſe an afflux of their ſecreted fluid to the ſurface, which, if not counteracted by an equal excitement of the abſorbent or recurrent veſſels, the conſequence will be an extravaſation of that ſecreted fluid, as we ſee actually takes place in ſuch caſes in the form of bliſters or veſicles; therefore one of the great deſiderata muſt be an application which excites the abſorbent ſyſtem equal

to the excitement of the exhalant, ſo that the circle of action which is neceſſary to keep up a living ſyſtem is thus preſerved. This ſalutary effect I have repeatedly ſeen produced by the application of ſpirit of turpentine even after ſlight veſications have appeared in different parts, the power of the application has been equal to produce abſorption; but where this has not taken place, I frequently find it equal to keep up the equilibrium of action, and prevent that unpleaſant effect which in the beſt mode of cure always produces a deſquamation of the cuticle.

From this view it will be ſeen that I have a high opinion of the powers of this application; and that opinion is not taken from theory alone, but from an extenſive uſe and attentive obſervation of the effects it produced upon the living ſubject in the moſt deſperate caſes.

Having thus given a ſhort comparative view of the efficacy of ſome of the applications formerly uſed, and which at preſent hold a very conſiderable degree of reputation in ſeveral hoſpitals in this country, as well as in different parts of the world; and likewiſe ſome of thoſe which, upon compariſon, I have found of infinitely ſuperior merit, it will be expected that I ſhould now give an account of the means I uſe in caſes according to the diviſion I formerly pointed out:—1ſt then,

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Of thoſe caſes where the action of a part is only increaſed.—To enable us to give a clearer deſcription it will be neceſſary to divide the treatment into two parts, namely, the external and internal.

*1ſt, The external means.*—

When the ſyſtem is expoſed to a certain degree of caloric (heat,) all its functions are performed well: If the heat applied to any part ſhould be gradually increaſed, the action of that part is likewiſe increaſed, which, if in a ſmall degree, and long continued, would produce various effects upon the reſt of the ſyſtem; but it is not this degree I am now to deſcribe; it is a ſudden application of a quantity of diſengaged or combined caloric to a part, which throws it into a violent ſtate of action according to the ſtructure of the part injured: This takes place ſometimes from the combuſtion of inflammable gaſſes, as in mines, or the exploſion of gunpowder; and, at other times, from heated or boiling fluids, ſuch as oil, ſteam, water, &c. or from heated ſolid metallic or ſtony bodies. The extent of the injury may be eaſily judged of from the appearance of the parts, except, as in the inſtances of the miners, where the cuticle is ſo filled with fine coal duſt as to render them quite black; but the feelings of the unhappy ſufferers will prevent

your neglecting any part which has been hurt; it will always, however, be better to apply the remedy to parts that have not been hurt, than to neglect any that have: The next dreſſing will ſufficiently point out to you if you have either been too profuſe or too negligent; but as the intolerable pain is ſuch, there is no fear but you will be called in as ſoon as poſſible: If veſications have begun to form, trouble neither yourſelf nor the patient to open them, as your time may be more uſefully employed: If the cuticle ſhould be lacerated in any part ſo as to expoſe the ſkin, it need not make any difference in the means uſed, as the extent and pain of an injury which has detached the cuticle by means of the violent application of heat, will not be increaſed, even in pain, from any application I have ever yet ſeen uſed.

Take a tea-cup and put ſome of the beſt rectified ſpirit of wine, or ſpirit of wine with camphor, or ſpirit of turpentine into it, then place it in a baſon of hot water, ſo as to heat it to what you can bear with your finger; then, by means of a rag dipped in this, or a probe armed with a good deal of lint, waſh and bathe the whole of the injured ſurface, which, when done two or three times over, apply plaſters to the whole, formed in the following manner:—

Take of the common yellow baſilicon according

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to the occaſion; let it be mixed up with as much ſpirit of turpentine as it will take to make it of the conſiſtence of a liniment, which, when ſpread upon thin old cloth, is to be applied to the part; the wax and oil of the baſilicon will fill up the pores of the cloth ſo as to prevent evaporation, by which means the ſtrong ſtimulant powers of the turpentine, or alcohol, or camphor, or all together, are ſo confined upon the ſurface, as to excite the abſorbents to the very increaſed action we wiſh; and when this has taken place, the ſmall quantity of oil is ſufficient to preſerve the cuticle in a pleaſant ſtate.

I have not found the ſtrict order given by former authors of very frequent dreſſings ſo neceſſary as they inculcated, nay, on the contrary, I have found them prejudicial; for the very quick evaporation that takes place on expoſing or uncovering the ſurface any time during the firſt four-and-twenty hours is pernicious; I therefore only dreſs the patient once a day even at the firſt, unleſs in ſome inſtances: If the accident ſhould happen early in the morning, he may be a ſecond time dreſſed in the evening, but even that indulgence is more in compliance with the prejudices of the patient and his friends, than from any advantage I have ever obſerved to ariſe from it; if he will ſubmit to it, it will be better to allow him to remain for the firſt

twenty-four hours without being diſturbed; if the plaſters are ſpread tolerably thick with the ointment, there will be no need of uſing any further means until the next dreſſing. On the following day, when you are going to dreſs your patient, the firſt thing to be done is to have your plaſters ſpread before you begin to take off the others; (they are to be ſpread with the digeſtive liniment, the ſame as at the firſt dreſſing,) and then not to take off more than one at once, as the leſs time the parts are expoſed to the action of the external air the better. It will ſeldom be neceſſary to have recourſe a ſecond time to the application either of the pure heated alcohol, or camphorated alcohol, or ſpirit of turpentine, as the redneſs or apparent inflammation will appear much leſs vivid; it will be neceſſary therefore to diminiſh your exciting means as the action diminiſhes; ſome proof ſpirit, or ſome laudanum with the coldneſs taken off, will be ſufficient for this dreſſing, and the plaſters immediately applied: They ought to have been ſo near a fire as to make them near the temperature of the patient's body, to avoid any chillineſs ſucceeding their application; this being done, your patient is to remain quiet for twenty-four hours longer, at which time you will generally find that the appearance of inflammation has diſappeared, and

where

where there had been any ſmall veſications in the firſt inſtance, there will be ſeen ſuch a ſecretion of pus as may be noticed the ſecond day after the application of a bliſter; the ſtimulants will now have performed their office, and if continued in, they will produce unpleaſant effects themſelves, ſomewhat reſembling the complaint they were meant to cure, although on a different part of the ſyſtem, as by theſe means the external abſorbent veſſels would be the moſt excited, whereas the original accident appears to have excited the exhalant veſſels more; for which reaſon, as the equilibrium of action will appear nearly to be reſtored, it will now be neceſſary to apply leſs irritating ſubſtances, therefore, inſtead of baſilicon made into a liniment with ſpirit of turpentine, it may be rendered into a proper conſiſtence with camphorated oil; ſhould even this be too ſtrong, and any appearance of irritation take place, the cerate with lapis calaminaris, or Goulard's cerate, will anſwer every purpoſe, and abate any irritation that may have ariſen from the former applications. What I have found very effectual in ſuch caſes, is an ointment made with the addition of a ſcruple of flowers of zinc to an ounce of the white ointment, *(i. e. the ung. ceræ. albæ.)* this continued until the part heals is in general ſufficient; but if the ſkin ſhould

after healing remain very tender, and likely to crack, a liniment formed of lime-water and linſeed-oil would be uſeful. I have frequently found much advantage from camphorated oil in this ſtage. Theſe means properly attended to, and keeping the tender ſkin covered from the too great action of the external air, I have found effectual in curing and quickly reſtoring the cuticle to a healthy ſtate, after moſt ſevere caſes.—See caſe of Mr Hopper.

*2dly, The internal means.—*

In order to form a judgment of what ought to be the internal means, let us inquire what effects are produced from ſlighter irritations upon ſubjects poſſeſſing different degrees of ſtrength:—Suppoſe, for inſtance, a healthy vigorous man receives a ſcald upon his body, of the ſize of the palm of the hand, a conſiderable degree of pain follows, the parts are thrown into a violent action, and, from abſorption and ſecretion being unequal, an effuſion takes place; whatever be the means that are uſed for this accident, the energy of the parts is ſuch, as in a few days to have run through their different ſtages, and the part gradually reaſſumes its former healthy functions, without having diſturbed thoſe of the other parts of the body. But had

had this accident happened to a man of an irritable habit, the conſequences would be very different; the pain would appear to be much greater, at leaſt the patient would ſhew greater ſymptoms of ſuffering; not only the action of the part would be increaſed, but alſo the action of all the ſympathiſing parts of the body, the pulſe would be quickened, and a real ſympathetic fever would take place; probably the part itſelf, inſtead of ſpeedily coming to a ſuppuration, might communicate its diſeaſed action to the contiguous parts, which would aſſume the eryſipelatous inflammation, and require a much greater length of time to run through the different ſtages of the diſeaſe. Now ſuch different effects being produced upon different ſyſtems, by exactly the ſame cauſe, would require very different treatment: To the robuſt conſtitution, nothing might appear neceſſary; the *vis medicatrix naturæ* would alone be ſufficient; nay, it might go further, and reſiſt the raſh attempts of ignorance under the ſpecious pretence of aſſiſtance. But with the nervous, irritable habit, we ſhould be obliged to have recourſe to tonic remedies, or ſubmit to long and tedious cures, which too frequently are the conſequence.

To what are we to attribute the different appearances in theſe two caſes, both ariſing from the ſame cauſe? Is it not natural to conclude, that the

the different degrees of ſtrength which they poſſeſſed was the cauſe? What concluſion may we draw from this? Surely, that ſtrength reſiſts the ſympathetic irritative actions of other parts, and that weakneſs induces them. Now if this is admitted, it will follow that in all caſes we ſhould make the ſyſtem as ſtrong as we can, immediately upon the attack; for, according to the degree of ſtrength the ſubject poſſeſſed at the time, ſuch will be the degree of injury. From whence it will follow, that in caſes of great magnitude, where the violence is conſiderable, the ſtrongeſt habit will ſtand in the ſame relative ſtate to this accident, as the weak irritable habit did to the ſmaller, that is, the quantity of violence is ſtronger than the reſiſting powers of the ſyſtem; the weakneſs therefore of the ſyſtem is the cauſe of its fall.—This weakneſs is no reflection upon the powers of the ſyſtem; for fire is not the element we are organiſed to exiſt in: But the ſubject leads to the inveſtigation of our powers, with reſpect to reſiſting the action of fire, in order that when we are unfortunately expoſed to its pernicious influence, we may place ourſelves in that poſture of defence, which, from experience, we are convinced is the beſt.

The animal ſyſtem performs a ſeries of actions; different parts have different functions; but the reſult of the whole is unity or health; for if any

part

part is either increaſed or diminiſhed in its proportion to the whole, the other parts ſympathiſe with it. This ſympathy is more ſtrongly marked in ſome diſeaſes than in others; the ſkin and the ſtomach have a particular ſympathy in moſt diſeaſes; and the ſkin in others, which are not of conſequence enough to affect the ſtomach.

In intermittents we find this ſolution of the continuity of action upon the ſurface, excites the ſyſtem to uſe the moſt violent exertions, which throws it into unnatural increaſed actions, in order to reſtore the unity of action; which when done, it gradually ſubſides, and leaves the body in a weakened ſtate, from the too great exertion which the alarm of the ſyſtem had thrown it into. As this exertion is totally involuntary, it may be termed the *vis conſervatrix naturæ*.

This ſymptom of intermittents ſeems entirely to have depended upon this cauſe; for if the ſyſtem is placed in ſuch a ſituation as to prevent this taking place, the other conſequences will not follow: For inſtance, previous to an ague fit, put the patient into a warm bed, keep him heated with cloaths, and excite the internal ſurface with warm ſtimulating ſubſtances, and that paroxyſm will not take place; that is, prevent the torpor of the part taking place, by keeping up the unity of the action of the whole, and all the ſymptoms will be avoided.

avoided. Now, it appears from the ſhivering always taking place in burns of any extent, that a ſolution of the continuity of action muſt, if great, produce the ſame effect, whether ariſing from exceſs, or defect of action in the part; that is, whenever a ſolution takes place from the torpor of a part, the whole is thrown into inordinate action, to make the part take up the action of the whole: On the contrary, when a ſolution of the continuity of action takes place, from the exceſs of a part, the whole ſyſtem is thrown into a commotion to take on the action of the part. Thus, in both caſes, the natural bias to an equilibrium of action is ſufficiently apparent. Vomiting, which is a common ſymptom previous to the hot fit of an intermittent, and ſeems to proceed from the ſympathy of the external and internal ſurfaces*, ſometimes takes place in burns. In one caſe where the ſubject was immerſed in caloric, which was in contact with the whole, without any intervening ſubſtance, the ſolution of the continuity of action brought on ſuch ſevere ſhivering, as to cauſe violent ſickneſs, and a bilious vomiting, the ſame as in an ague fit.

From what has been already ſaid, it will appear obvious, that the intention to be fulfilled ought to be

* By internal ſurfaces, I mean all the ſecreting ſurfaces of the body, which I believe have a very conſiderably ſympathy with each other.

be *the reſtoring the unity of action of the whole ſyſtem as ſoon as poſſible;* ſo that thoſe parts which have only had their action increaſed, are, by this reunion, as it were, to the ſyſtem, allowed again to form a part of the whole, and recover as it were by the firſt intention; the more immediately theſe means are uſed the better. The firſt few hours in the treatment of ſuch accidents is of the greateſt moment; as the cauſe was violent and inſtantaneous, the effects will be in ſome degree ſimilar: This mode of relief is only to be continued for a certain length of time, and it requires great attention in the practitioner to be enabled to throw the ſyſtem into ſuch a ſtate as to abſorb the diſeaſed action, and then gradually bring down the whole to the natural ſtandard of action, by nicely diminiſhing the exciting powers, ſo as to aſſiſt, and not offend, the ſyſtem by our interference. After the excitement has been carried as far as may have been thought neceſſary with *æther* and *alcohol* internally, which ought only to be given once or twice, and that within the firſt eight or twelve hours, wine or ale may be allowed the following four and twenty hours, and very little on the third day, as the ſecretion of pus will begin to take place, when it will be no longer neceſſary to excite the ſyſtem. I have generally added laudanum to the alcohol, from the

general

general idea of its abating pain; whether in this complaint it may be an auxiliary to the other means or not in the firſt inſtance I am uncertain, but future experience may enable me to gain that information, either from my own obſervation or that of ſome of ſome of my medical friends, who have promiſed that they will not only give me information on that part, but of every other particular which may occur; and ſome of them have extenſive fields for remarks upon the treatment of this ſpecies of accident.

Secondly,—Of thoſe caſes where ſome have their action increaſed, and others their action deſtroyed. The mode of treatment in this claſs, I ſhall divide into two parts, namely, the external and internal means.

*1ſt, The external treatment.*—

Having already mentioned what I found the moſt advantageous in burns with only increaſed action, it will be unneceſſary in this place to repeat what was there ſaid: I ſhall only add, that as I never ſaw a burn where the part was ſo completely deſtroyed as not to leave other parts where the action was only increaſed, I ſhould ſtrongly recommend the uſe of thoſe means which would ſave the then living parts; this is of the firſt conſequence;

as

as for the dead parts, the application which is immediately applied to them is of very little conſequence, for the throwing off theſe eſchars depends upon a proceſs of the ſyſtem, which the immediate application to the dead part will in no way either retard or facilitate; but to place the contiguous parts in a ſtate of health and ſtrength, ſo as to perform their actions with vigour, will certainly facilitate the proceſs, and relieve the ſyſtem from greater efforts, and the patient from a tedious cure.

The progreſs of thoſe parts which have only been ſlightly injured, will lead us to form a judgment of the ſtate of thoſe which are further injured; for if the curative indications take place ſoon, and proceed with vigour in the one, we may be aſſured all the other functions are performing their offices duly in the other. As ſoon as the ſkin which has had the cuticle detached from it, begins to ſecrete pus, which is ſometimes the caſe upon the ſecond day, the parts adjoining an eſchar begin the ſuppurative proceſs; that is, they tumify, and the abſorbents detach the dead and living parts from each other, while the exhalant or ſecreting veſſels form pus; thus the ſurface is reſtored to its former functions, that of a ſecreting and abſorbing ſurface, and although the parts are not guarded in the manner nature meant, yet, when the natural

ſurface

ſurface of a part is deſtroyed, this *ſecretion* and *abſorption* is neceſſary to the healing proceſs, and the quickneſs or ſlowneſs with which an ulcer heals principally depends upon the management of theſe ſtates. I am now ſpeaking of the moſt favourable caſes; for though in ſome ſubjects this proceſs may begin in ſixty hours, yet I have ſeen it retarded to the tenth day, and the patient recover; but in general I believe it will be found that if it does not take place before that period, the eryſipelatous inflammation is communicated by the abſorbents, and the ſecreting veſſels having their action upon the ſurface ſuſpended, the inactive parts become greater and greater, till at laſt the ſyſtem, thrown into *deſpair* as it were, increaſes its action, ſo as to exhauſt its powers; and the whole fabric ſinks, from general debility and local ſymptoms of mortification. The eſchar will begin to detach itſelf around the edges, and, when once the ſkin is ſeparated, the other parts will follow according to their ſpecific nature: If only the adipoſe and cellular membranes are affected, they will ſoon be abſorbed and leave the wound in a ſituation to granulate. During the proceſs of ſloughing, a cataplaſm of milk and bread, from its ſoftneſs, and as applying a grateful degree of the ſtimulus of heat, is perhaps one of the beſt topical applications

tions at this period; the eſchar may be waſhed with a little camphorated ſpirit ſo cautiouſly as to avoid touching the living parts, by which means the offenſiveneſs of the wound will be much leſs to the patient and the attendants. Should the proceſs ſtop at any period, touching the part either with camphorated *ſpirit*, or *eſſential oil of turpentine* will be a ſufficient ſtimulus to produce a renewal of action. If the ſecretion of pus round the edges of the wound, from the application of the cataplaſm, ſhould be too great, they ſhould be waſhed with a little tepid Goulard's water, and afterwards well duſted or covered with ſome flowers of zinc: A cataplaſm made with Goulard's water is ſometimes of very great uſe; but if the ſurface was large, or the wound deep, the abſorption of this mineral ſolution is ſometimes attended with danger: Nay, I have ſometimes ſeen bad effects from it in an ointment, which has induced me to give the preference to the *flowers of zinc*, or the *lapis calaminaris*. When the dead parts are come away, the wound muſt be treated in ſuch a manner as to keep as exact a balance between the abſorption and ſecretion as poſſible; ſometimes gently exciting, at others repreſſing, ſo as to allow the ſyſtem to repair itſelf, which all its efforts tend to; but, as much of this depends upon the internal means, we muſt now treat of that.

*2dly, The internal treatment.*

From the opinion which I have already advanced, viz. that I never ſaw ſo compleat a deſtruction of a part as not to have left other parts only in a ſtate of greater action, it will be natural to conclude, that the mode of treatment I followed in caſes of increaſed action, will be neceſſary to be purſued until thoſe parts are reſtored to the ſyſtem; I ſhall therefore refer the treatment in the firſt inſtance to that head, and ſhall now only add what will be neceſſary, after the unity of action has taken place with all the living parts, to throw off thoſe that are dead; and the after-treatment to facilitate the cure.—After the ſyſtem has been excited to ſuch increaſed action as to take up the action of the diſeaſed part, it will not afterwards be neceſſary to continue it longer, although it muſt not be ſo quickly lowered as if there were no eſchars. When the unity of action is reſtored, the next proceſs will be the commencement of the ſeparative, that is, the edges of the eſchar will tumify, be abſorbed, and pus ſecreted: This proceſs of the ſyſtem requires ſtrength, that is, according to the ſtrength of the ſubject, it goes on more or leſs favourably; therefore the internal means muſt be ſuch as give ſtrength without increaſing action;

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This is perhaps anſwered by what is called a ſtrong nouriſhing diet, better than by any other means; at the ſame time diminiſhing the fermented liquors. The bark is by ſome ſuppoſed to poſſeſs the power of ſtrengthening in a very conſiderable degree; it therefore may be given in decoction, or in powder mixed with milk: The latter mode ſeems to have the advantage, as it anſwers partly for food at the ſame time. An anodyne may be given at night, as reſt contributes much to facilitate the proceſs; for all the actions which are involuntary, are leſs diſturbed during ſleep than at any other time, conſequently better performed. This ſtrengthening plan ought to be continued until the eſchar has looſened around the edges, when it may be leſſened, by taking leſs animal food, but ſhould not be totally deſiſted from until the wound is quite free from the dead parts; when inſtead of giving much ſtrengthening food to ſupport the diſcharge, he ought to be put upon rather a ſtrict diet than otherwiſe, by which means the diſcharge moderates, the granulations take a firm healthy aſpect, fungus is prevented, and the cure will proceed with ſuch a degree of quickneſs as to aſtoniſh the ſurgeon, ſhould he have been accuſtomed to view the ſlow progreſs from the former methods of treatment.

## CASE.

G. H. a pitman, aged about 36, belonging to a coal-work in the neighbourhood, in the month of November, 1792, was expoſed to the action of diſengaged caloric, from the combuſtion of a large quantity of hydrogen gas, which, from the neglect of keeping up the circulation of the atmoſpheric air, had been allowed to collect in a part of the work he had to paſs with one of the ſmall lighted candles they work with, which acting as a combining medium of the oxygen and hydrogen gaſſes, cauſed the exploſion: He had on a flannel ſhirt, drawers, and ſhoes and ſtockings, ſo that the parts expoſed to the contact of the flame were his face, neck, and part of his breaſt, alſo his hands, and ſome part of the arms; from the whole of the face being much burnt, particularly the lips and the noſtrils, there was as much reaſon to ſuppoſe this man as much burnt internally as any I ever ſaw; the hands in ſeveral places appeared deeply burnt, and he had very ſevere ſhivering fits, and all the bad ſymptoms which indicated a very rude ſhock to the ſyſtem: The whole of the burnt parts were liberally waſhed with ſpirit of turpentine, and covered with plaſters ſpread with a liniment compoſed of baſilicon, made very thin with

with ſpirit of turpentine; he had a cardiac draught with fifty drops of laudadnum to take inſtantly; a pint of oily emulſion with an ounce of camphorated tincture of opium, to take a tea-cup full every three hours; and a bolus at night with two grains of opium; the diet was ordered to be generous and ſtimulating

*Second day.*—Had ſeveral paroxyſms of pain during the night, and alſo ſome ſhort intervals of repoſe; ſlight veſications appeared in different parts of the neck and face; the ſerum of theſe was diſcharged by puncturing them with the ſharp point of a probe; it was not thought neceſſary to repeat waſhing the parts with the eſſential oil of turpentine, but to uſe ſomething leſs ſtimulating; tincture of opium was thought of and applied, after which the dreſſings as before; a decoction of the bark, with the proportion of two ounces of the tincture to a pint, was ordered to be taken in the quantity of a tea-cup full every two hours; the bolus, with opium at night, was repeated, with the addition of five grains of calomel to obviate conſtipation; he continued the diet as at firſt ordered.

*Third day.*—Had more ſleep laſt night, and leſs pain than the night before; the redneſs of the neck and breaſt had a good deal diſappeared; where the veſications were, a kind of ſecretion had taken place, ſuch as may be remarked upon the

ſecond or third day after the application of a bliſter; ſome of the redneſs had alſo diſappeared about the wriſts, but the hands ſeemed to remain much in the ſtate they were in at firſt; the redneſs was not ſo perceptible as before, and the parts ſecreting had nothing applied to them but the plaſters as before; the parts of the hands which appeared little changed, were again waſhed with the tincture of opium, and treated as before; the medicines were continued, except the calomel, which had procured a ſtool.

*Fourth day.*—Was not ſo eaſy laſt night as he had been before: pulſe 110; tongue dry with thirſt; the parts which had been red, and ceaſed to appear ſo, were now reaſſuming that appearance, and the ſecreting ſurface under the veſications was dry; from theſe circumſtances I ſuppoſed that the ſtimulating applications to the abſorbents being continued after they had reabſorbed the ſecreted fluid, might be the cauſe of this reappearance of inflammation, accordingly I ceaſed the digeſtive liniment, with the baſilicon and oil of turpentine, and applied plaſters ſpread with *ceratum é lapide calaminari* to the face, neck, and breaſt; the hands were tumified, but as there had been no appearance of pus upon them, I judged that to be an effort of the ſyſtem to throw of the eſchar; with

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this view I therefore continued the former dreſſings to the hands; the ſame medicines and diet were ſtill ordered.

*Fifth day.*—Has paſſed an eaſier night; pulſe 100; the new inflammation upon the face, neck, and breaſt not ſo violent as before, and a little moiſture on the part which had been ſecreted; the dreſſings to thoſe parts the ſame as yeſterday; the hands ſtill much tumified; they are dreſſed as before; continue medicines as before.

*Sixth day.*—Continues eaſier; the face, &c. much better; ſome parts beginning to ſkin; the hands remain much ſwelled, but the ſkin is beginning to ſeparate, and a degree of moiſture to be ſecreted round the edges of the burnt parts; the ſame means continued.

*Seventh day.*—The upper parts are healing very rapidly, and there is a greater ſecretion of pus from the hands.

*Eighth day.*—Appearances ſtill as favourable; the hands ſecrete a great quantity of pus, and the eſchars are looſening; both external and internal ſtimulants having brought about the ſtate of the ſyſtem I wiſhed, that is, a ſufficient ſecretion of pus, it now appeared from my former experience to be neceſſary to deſiſt urging the ſyſtem any further, therefore the diet was changed in its quality, and

the tincture of bark was omitted; one half the quantity of opium was given, and the dreſſings on the hands were changed for the ſame cerate as the face.

From the eighth to the fifteenth the ſame means were continued with the beſt effect; the change of diet moderated the diſcharge, and brought on the diſpoſition for healing in a much better and more rapid manner than I was ever before capable of producing: Notwithſtanding the uſe of every topical aſtringent, the quantity of pus formerly ſecreted, and for the length of time, brought on ſuch a ſtate of ſurface, as reſiſted every effort of art to heal; and the very means purſued to prevent the patient ſinking under the diſcharge, appears if not to have been the only, at leaſt the moſt hurtful, cauſe of the complaint it was meant to remedy. The face and neck being now ſkinned, they are anointed once or twice a day with ſome camphorated oil to prevent the cracking of the new ſkin, which is likewiſe of much uſe in taking away that unpleaſant redneſs which ſometimes remains a long time after the cure. The ſloughs upon the hands come away kindly; three of the nails of the left hand have been thrown off, and the ulcers are healing at the edges.

From the fifteenth to the thirtieth day nothing particular happened; the ulcers gradually cleaned, and

and after the formation of granulations when there was a loſs of ſubſtance, they healed kindly; a little fungus now appearing, required to be touched with the common *aqua cærulea*, and in about ten days more the cure was compleat, that is to ſay, the whole was covered with a cuticle, but which as yet was very tender, and required time and caution both to give it ſtrength, and to reſtore the motion gradually and ſafely to the flexors and extenſors of the fingers, which, from want of uſe, had acquired a degree of rigidity; by the uſe of camphorated oil, and keeping the parts from the external air by the uſe of gloves, in the courſe of a fortnight more he was perfectly cured.

## CASE.

I. K. aged 20, a clerk in a foundery in the environs of Newcaſtle, on the 23d of June, 1794, trying ſome experiments on the fluxing of braſs, had the misfortune to let the crucible, when at a white heat, fall into the aſh pit, which had been previouſly filled with water to increaſe the heat of the furnace, which it does by ſupplying an elaſtic vapour capable of being decompoſed by the fire, and thereby aſſiſting very conſiderably the combuſtion: The inſtantaneous decompoſition of ſome of the water in the aſh pit, from the ſudden application of the heated metal, cauſed a great exploſion,

ploſion, equal in report to the greateſt piece of ordnance, and terrible in its effects; the windows of the building were blown out, and the operator thrown to a conſiderable diſtance; he received conſiderable injury from the violence of the ſhock, the heated elaſtic vapour from the water, and portions of the fluxed metal upon different parts of his body: The face was the moſt expoſed to the vapour, the whole of which was much burnt; the eye brows, eye laſhes, and a great portion of the hair of the head, were quite conſumed; the integuments of the eyes, and the tunicæ conjunctivæ were ſo much burnt as to make me apprehend the loſs of theſe organs, but more eſpecially the left, which had ſuffered the moſt; the neck and a portion of the breaſt were alſo affected from the vapour: the legs and feet appeared moſt injured from the metal, as thoſe parts had a number of circumſcribed ſpots of different ſizes;—theſe had gone through his cloaths, which, for his lower limbs, were nothing but trowſers at the time of the accident; ſeveral metallic ſcales which had adhered to the integuments, were detached by the point of a probe; theſe had inſtantly formed an aſh-coloured eſchar. He was viſited within a quarter of an hour after the accident: His ſituation and appearance was ſo dreadful as to render a deſcription

deſcription impoſſible,—blind, frantic with pain, all his entreaties were to give him inſtant death;—ſhivering as if in an ague fit, yet dying from a ſenſe of burning heat over the whole of the injured parts: The eſſential oil of turpentine was liberally applied to every burnt part except the eyes, which from the ſwelling of the integuments would have been impoſſible, except they had been opened by force, but it was employed to the integuments themſelves, and then covered over with plaſters ſpread with the digeſtive liniment; fifty drops of laudanum in a cardiac draught was inſtantly given, and as ſoon as the dreſſings were compleated, he was put to bed; a mixture with the cardiac confection and camphorated tincture of opium was ordered, to take a doſe every hour until eaſier. The accident happened about four o'clock in the afternoon; on ſeeing him in the evening about nine o'clock, found the pain had gradually abated in about three hours ſo as to be ſupportable, yet his mind was greatly agitated in reſpect to the fear he had of loſing his ſight: I therefore ordered him another cordial draught, with thirty drops more laudanum to take immediately, and to go on with the mixture when awake in the night, and to have ſtrong port wine negus to drink when thirſty.

*Second*

*Second day.*—Pulſe 120; has had paroxyſms of ſevere pain during the night; has alſo had ſome diſturbed ſlumbers; on dreſſing the parts this morning they appear much as at firſt, except that ſome ſlight veſications appear about the face, neck, and breaſt; the eyes are totally [illegible] ture of opium and camphorated [illegible] waſh the burnt parts with to-day, and [illegible] dreſſings repeated; two ounces of decoction of bark, with ten grains of cardiac confection, are given every three hours; the anodyne with thirty drops at night; the negus to be continued, and any food he can take, either roaſted or boiled.

*Third day.*—Has been eaſier than before; pulſe ſtill 120; more veſications; in other reſpects appearances much the ſame as yeſterday; continue diet and medicines as before.

*Fourth day.*—Has been much the ſame as the laſt four-and-twenty hours; an appearance of pus where the veſications were; the ointment to be changed in thoſe parts to the *ceratum è lapide calaminari*, but in the other parts, where no appearance of ſecretion is taking place, the waſh and the former dreſſings continued; medicines and diet the ſame.

*Fifth day.*—Remains pretty free from pain; a good deal more pus appears upon the face, and a diſcharge from the angles of the eyes; he thinks

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he perceives a light when a candle is brought near his right eye; this circumſtance has given him great pleaſure; the circumference of the eſchars on the lower limbs, cauſed by the heated metal, is beginning to inflame and tumify round the edges, attended with a good deal of pain; the waſhing them with the mixture of opium, camphor, and ſpirit, gives immediate relief; the digeſtive is alſo continued, and the other means as before, except that a bolus, with five grains of calomel, is given to cauſe a motion.

*Sixth day.*—Has had a motion from the calomel; a conſiderable diſcharge of pus from ſeveral parts about the face and neck, but more particularly from the eyes; the ſwelling abating, ſhew the eyes themſelves to be in a very inflamed ſtate; a little of the following ointment is applied with a camel's hair pencil upon the eyes; an ounce of roſe water, with twenty drops of extract of lead, gradually mixed in a marble mortar, with an ounce of the unguentum album of the ſhops. Some of the eſchars are beginning to grow moiſt round the edges. The exciting means having ſo quickly brought my patient to this ſtage, I began to diminiſh the ſtimulants; the negus was gradually withdrawn, and a little boiled meat or broth once a day was now thought ſufficient; and as the cuticle around the eſchars was off, expoſing the living parts

parts below, I found the uſe of the ſpirits, &c. painful, and therefore deſiſted from its application, and uſed the cerate inſtead of the digeſtive.

From the *ſixth* to the *twelfth* continued to recover very faſt; the face, neck, and breaſt have ſkinned rapidly; the eyes remain weak, diſcharge much, and are apparently much inflamed; eight ounces of blood are taken from the arm, and a collyrium with a ſolution of vitriolated zinc is ordered; the ulcers upon the legs are cleaning; he takes the bark decoction alone, and ceaſes taking the anodyne; his diet is now to be much more ſevere; no fermented liquors of any kind; milk night and morning, with a very little boiled meat at dinner, and toaſt and water for his common drink.

*Sixteenth day.*—The eyes appear better for the bleeding and regimen; they are ſtill inflamed, and viſion not clear, but gradually growing better; the new and tender cuticle of the face, neck, and breaſt is anointed with camphorated oil to guard it from breaking; the ulcers of the lower limbs going on well; granulations forming to reſtore the loſs of ſubſtance, and ſkinning round the edges.

From this time to the *thirtieth day* his progreſs was regular and his cure was compleat; he continued the ſtrict regimen, and occaſionally took a

doſe

doſe of purgative medicines; as his eyes continued weak, he went into the country for quietneſs, and returned in a fortnight perfectly well.

## CASE.

L. M. aged 45, a labourer at a mill in Newcaſtle which is worked by the power of ſteam, having ſomething to do about the boiler, miſſed his hold and fell in; he fortunately caught hold of ſome part of the machinery which prevented his total immerſion, and only his legs up to the knees were expoſed to the boiling water: When I ſaw him his ſituation was truly lamentable; in taking off the ſhoes and ſtockings, the cuticle, which had been totally detached by the boiling water, was lacerated and torn in ribbands hanging over his ankles; he was dancing round the room from pain, and when he ſtood to ſpeak his teeth chattered in his head; the whole of the legs were immediately waſhed with alcohol, and afterwards the plaſters ſpread with the digeſtive liniment, formed with the baſilicon and the ſpirits of turpentine; a cardiac draught with ſixty drops of laudanum were immediately ordered, with a cardiac mixture and camphorated tincture of opium to be taken every two hours, with orders that he might take any thing comfortable either to eat or drink.

*Second*

*Second day.*—The pain gradually abated after he was dreſſed for about three hours, when it remained ſtationary, and returned in paroxyſms, which became leſs painful, and of ſhorter duration the one than the other; a few veſications about each ankle; the other parts have much the ſame appearance, except that there is a conſiderable ſwelling upon one of the ſhins, which I ſuppoſe muſt have ariſen from ſome contuſion, although he is not conſcious of any thing of the kind having taken place; notwithſtanding which I have no doubt of its ariſing from that cauſe, for in ſuch circumſtances, conſciouſneſs is very imperfect: The parts were waſhed with tincture of opium and camphorated ſpirit of wine in equal proportions, and the former dreſſings applied; the mixture was continued, and an opiate at night, with only thirty drops of laudanum, was ordered; the generous diet to be perſevered in as at firſt ordered.

*Third day.*—Has paſſed a tolerably eaſy night; pulſe 110; ſome ſlight appearance of ſecretion where the veſications were; ceaſe to apply the ſpirits and digeſtive to theſe parts, and uſe the *ceratum é lapide calaminari;* the bruiſed part ſeems to be ſo much deſtroyed as to be irrecoverable; the digeſtive is continued to it, and it is treated as an eſchar; a warm milk and bread cataplaſm, with ſome ſpirit of turpentine ſprinkled upon

upon it, to be applied to this part; the anodyne mixture was now desisted from, and a decoction of bark with some of the cardiac confection ordered, and the diet is to be gradually diminished in respect to its stimulant qualities; the proportion of fermented liquors less; five grains of calomel to be given at night, as he is rather costive; the night draught as before.

*Fourth, fifth, and sixth days.*—Has continued to do well; pus secreted where there were vesications, and the process of skinning is going on rapidly on both legs, except in the part mentioned to have been tumified, which, with the use of the cataplasms, appears as if it would separate; it is now turning moist about the edges; continue the cataplasms alone to that part, and the cerate to the others; the diet is to be now moderate,—not very severe, as he is of a debilitated habit, nor stimulating, as it would cause too great a secretion, without adding strength; the bark in substance to be taken twice a day.

From the *sixth* to the *sixteenth* nothing particular took place to retard the progress of the cure, which in respect to the scald might be said to be compleat, as the legs were now covered with a new skin; to guard which from cracking, I ordered the liniment, with linseed-oil and lime-water, but the

eſchar, though nearly all thrown off, has left a kind of ulcer which will require ſome time yet to heal; a little dry lint is applied to the center as an abſorbent, and afterwards covered with a plaſter of cerate.

The ulcer continued to heal, and in leſs than a fortnight was well. The liniment with lime-water and linſeed-oil appeared to anſwer very well in this ſtage of the complaint, as an application to harden the new ſkin, and to prevent its cracking and breaking, as new cicatrices are liable to do.

The following caſe, which appears to have had a great ſimilarity with one related in the former part of this Eſſay, page 30, from Van Swieten's Commentaries, as having happened to the celebrated Boerhaave;—the treatment having been totally different, I ſhould wiſh them to be contraſted.

## CASE.

Mr Hopper, my apprentice, diſtilling ſome roſe water on the 14th of Auguſt, 1795, in a portable tin ſtill, having filled it too full, the head became ſtopped up, which rendered it exactly ſimilar to Papin's digeſter: Having remained thus for ſome time, the fire being urged, and nothing coming over, the head was thrown off with conſiderable violence

violence, and the contents were thrown upon the operator; he received them principally upon the thighs; his covering was only a thin pair of pantaloons; the thighs were each of them ſcalded for a ſpace that would have taken half a ſheet of paper to have covered the ſurface, beſides the whole of the ſcrotum and penis, as were different parts of the wriſts: In taking off his cloaths, a ſmall portion of the cuticle was torn, and ſome veſications took place immediately; the parts were profuſely bathed with ſpirit of turpentine, and dreſſed with the liniment formed with baſilicon thinned with ſpirit of turpentine; this was at half after eleven o'clock; he was put to bed, and had a violent ſhivering fit; a large bladder full of hot water was placed between his legs, and he took ſixty drops of laudanum in a bumper of brandy; the pain gradually abated, and in about an hour after he was quite eaſy, when a little after a ſlight rigor came on, which was ſucceeded by a paroxyſm of pain; this continued to be repeated at more diſtant intervals, and with leſs violence during the courſe of the day; in the evening he was tolerably eaſy; his pulſe two hours after the accident had mounted up to 90, but now it has returned nearly to its natural ſtandard, about 60.

*Second day.*—Has paſſed an eaſy night, and is

now free from pain, nor has he had much uneaſineſs ſince yeſterday afternoon; on examining the parts to-day when dreſſing, the extent of the inflamed ſurface is very conſiderably diminiſhed, ſo that a reſolution of the inflammation has taken place, or if I may be allowed to uſe the expreſſion, a great part of the injured ſurface is cured by the *firſt intention*. The parts were waſhed to-day with tincture of opium and camphorated ſpirits, and the ſame digeſtive liniment as before was uſed for the plaſters; he had made a great quantity of urine during the night, which was ſtrongly impregnated with the odour of the turpentine,—a ſtrong proof of its abſorption by the ſkin; the great cauſe why I think it preferable to any other application.

*Third day.*—The waſh having come in contact with the part where the ſkin was off, had cauſed a ſlight degree of pain, which he deſcribed to be ſimilar, though infinitely leſs in degree, to what he originally felt in ſome of the paroxyſms; it ſoon ſhaded itſelf away, and he remained eaſy; this part itſelf had been well waſhed at firſt, though the ſkin was off, with the ſpirit of turpentine, and ſo far from having given any pain, it abated the pain from the moment of its application; the appearance of the parts continue nearly as yeſterday, except that there is a little moiſture where the ſkin

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was off, which ſeems to hold a middle ſtate between ſerum and pus; the exciting means having ſo aſtoniſhingly brought the ſurface to a ſecreting ſtate, they were deſiſted from, and the parts covered with the following ointment, *Ungt. ceræ albæ* ℥ij. *Florum Zinci* ℈i.

*Fourth day.* Has been very eaſy ſince the laſt dreſſing; one of the places where the cuticle was off is thinly covered with very good pus; the inflammation has nearly diſappeared; in thoſe places where the cuticle was detached from the ſkin, it is cracking, and a new cuticle is forming underneath, without any appearance of moiſture.

*Fifth day.* The part which was covered with pus is drying, and nearly ſkinned over; the cuticle of the penis and ſcrotum peels of in large ſcales, and leaves a perfect ſkin underneath; a conſiderable degree of itching in the part; continue the ſame ointment, and take an ounce of ſalts in a baſon of broth.

*Sixth day.* The whole of the parts covered with cuticle, but as it is yet tender, to continue the plaſters for a day or two; he may now be ſaid to be cured.

The whole of this caſe has in ſo pointed a manner eſtabliſhed the ſuperiority of practice when conformable to the laws of the animal œconomy,

that upon its reviſion, it appears ſo unlike the common courſe of any injury of even half its magnitude that I ever ſaw, as to make me doubt it will meet with that ready credit which I know it deſerves: In compariſon not only of the efficacy, but of the manner, I think it merits Aſclepiades's motto, "*tuto, celeriter, et jucundé.*"

## APPENDIX.

HAVING appropriated the ſecond chapter to the detail of the various opinions of different phyſicians and ſurgeons on the ſubject of Burns, I muſt explain why I did not place the following there alſo: I would obſerve that I only wiſhed to bring ſuch a maſs of evidence of the indefinite ſtate of our knowledge upon this ſubject as might appear a ſufficient apology for laying it before the public in the preſent ſtate, as an inveſtigation highly intereſting and cloſely connected with principles, which are not merely confined to the treatment of this injury, but may ultimately exerciſe a very material influence upon the practice of ſurgery in various diſeaſes. Hoping that the neceſſity of the inquiry was made ſufficiently apparent, I wiſhed not to exceed due limits in quoting authorities;

thorities; yet there remain ſome obſervations, communicated to the late Mr John Hunter, and recorded in the ſecond volume of Medical Facts and Obſervations, &c. by Mr David Cleghorn of Edinburgh, which contain ſo much candour in the relation of the facts, and are ſo ſtriking in themſelves, that I cannot avoid taking notice of them. Mr C. is not of the faculty, and avows himſelf unbiaſſed by any theoretical opinion, adhering ſtrictly to appearances reſulting from experience, ſo as to enable him to *conclude*, that the certain repeated effects were produced by as certain known cauſes.

Mr C. recommends the immediate application of vinegar, which is to be continued for ſome hours, by any the moſt convenient means, until the pain abates. Should it return, the vinegar is to be repeated: If the burn is ſo ſevere as to have deſtroyed any part, when the pain has ceaſed it is to be covered with a poultice made of white bread and milk, which remains ſix, or at moſt eight hours; when removed, the part is to be entirely covered with very finely powdered chalk, until every moiſt appearance upon the ſurface of the ſore has diſappeared, when it is again to be covered with the poultice. The ſame mode is then to be purſued every night and morning until the cure is compleat. If the uſe of poultices appears to relax the wounds too much, they are to be covered with a

plaſter or ointment made with white lead, but the chalk is ſtill to be uſed next the wound.

In reſpect to general remedies, he ſays, "I allow my patients to eat boiled or roaſted fowl, or in ſhort, any plain-dreſſed meat they like; and I do not object to their taking (with moderation, however) wine, water and ſpirits, ale, or porter. My applications, as hath been already obſerved, allay pain and inflammation, and alſo always either prevent or remove feveriſhneſs; and at the ſame time (if one may judge from their effects) they have powerful antiſeptic virtues; I have never had occaſion to order bark or any internal medicines whatever, and I have only once thought it neceſſary to let blood. When a patient is coſtive, I order boiled pot-barley and prunes, or ſome other laxative nouriſhing food, and ſometimes an injection, but never any *purgatives*. It is diſtreſſing to a patient with bad ſores to be often going to ſtool. Beſides, I have remarked that weakneſs and languor (which never, in my opinion, haſten the cure of any ſore) are always brought on, more or leſs, by purgatives. From the effects too I have felt them have upon myſelf, and obſerved them to have upon others, they do not ſeem to me to have ſo much tendency to remove heat and feveriſhneſs, as is generally imagined; and I ſuſpect that, contrary to the intention of adminiſtering of them, they often-

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er carry off *uſeful humours* than *hurtful ones*. But I am going out of my depth, and expoſing myſelf to criticiſm, by ſpeaking upon a ſubject that I ſurely muſt be ignorant of; I will therefore return to my vinegar. I have already ſaid that I always prefer *wine* vinegar when it is to be had; I have however uſed, with very good effect, vinegar made of ſugar, gooſe-berries, and even alegar; but whichever of them is taken, it ought to be *freſh* and *lively taſted*. I once made ſome trials (on a burn I met with myſelf) of oil of vitriol diluted with water, and of different degrees of ſtrength; but I found its effects to be the very reverſe of vinegar, for it increaſed the pain and heat even when it was pretty much diluted. I make no doubt but diſtilled vinegar might do; but ſince the common ſort, when freſh and good, has in every caſe been ſo efficacious, there ſeems to be no occaſion to attempt improving upon it; and as acids are of a pungent penetrating nature, perhaps it would not be ſafe to apply one too ſtrong to a raw and tender ſore. Even the common vinegar, only by being uſed too *cold*, affected two of my patients with *tremblings* and *chillneſs*, which alarmed me a good deal. I removed theſe ſymptoms indeed (as I before mentioned) very readily by warming the patients feet with cloths dipped in warm water, and giving them warm water and

ſpirits

ſpirits to drink; but ever ſince I have been careful to uſe precautions againſt the like ſymptoms, particularly in cold weather, by *warming* the vinegar a *little*, placing the patients near the fire, giving them ſomething *warm internally*, and, in ſhort, by keeping them in every reſpect *in a comfortable condition.*"

The number of caſes related by Mr Cleghorn in his letters to Mr Hunter, beſides a ſtill greater number he has attended during a period of ſeventeen years, demand a degree of attention and inveſtigation, more particularly after I have been offering what at firſt appearance may be ſuppoſed to be a very different mode of practice. The vinegar which Mr Cleghorn relies the moſt upon, is that made of the *beſt white wine*, and even this is only efcacious whilſt it remains *freſh* and *lively taſted*, and muſt be changed or renewed as ſoon as it becomes vapid, or has loſt its ſpirit. Do not theſe remarks, made by Mr C. himſelf, plainly point out to us that the great efficacy of his remedy reſides in the proportion of alcohol, or ſpirit remaining in the vinegar, after it had undergone the acetous proceſs? It is apparent, from the experiment he made upon himſelf, with the diluted ſulphuric acid, that the acid alone is not the part of the application to be depended upon.

I have not the pleaſure of knowing Mr Cleghorn, but

but ſhould theſe obſervations fall into his hands, I ſhould be happy if he would try the uſe of alcohol, and appreciate its merits with vinegar. It would alſo be worth obſervation to try if ſpirit, added to the vapid vinegar, would reſtore to it thoſe curative powers which it before poſſeſſed. I purpoſe trying it myſelf, ſhould a favourable occaſion occur; but it would be much ſooner determined by Mr C. as with him the powers of the vinegar are aſcertained, whereas, with me, I ſhall have to aſcertain its powers before I can make a compariſon.

The next application Mr C. makes, is powdered or ſcraped chalk: This is confeſſedly uſed as an abſorbent, and, from the relation of the caſes, with very great benefit. It was with this intention that I uſed large quantities of powdered *lapis calaminaris* in the caſe related of E. F.; yet in that caſe I found it inſufficient, and was obliged to have recourſe to ſubſtances of a cauſtic nature. It will be ſeen that I attributed the abundant diſcharge in that caſe to a too great excitement of the ſyſtem in that ſtage of the complaint; and I have no heſitation in ſaying, that by a very different mode, (which I have deſcribed) the profuſe diſcharge which formerly accompanied ſuch accidents, may be avoided. I have ſometimes, in ulcers in the legs, uſed chalk as an abſorbent; in one or two inſtances

inſtances it rather increaſed the diſcharge, and gave pain: I attributed theſe effects, in ſome degree, to its not being ſufficiently powdered, but have not ſince uſed it. When I firſt heard of Mr C.'s uſing vinegar and chalk for burns (i. e. before I had read his letter to Mr Hunter) I ſuppoſed he had put on the chalk immediately after the vinegar, with a view of diſengaging the carbonic acid gas. From ſome experiments of Dr Beddoes's upon himſelf, it would appear, that the ſkin deprived of its cuticle by a bliſter, and rendered acutely painful by the contact of the atmoſphere, is inſtantly ſoothed by its immerſion into the carbonic acid gas, and that the pain as ſoon returns upon changing the medium. How far the acid gas would be of uſe in the firſt inſtance, I have my doubts; I think it could not act ſufficiently through the cuticle, but I have no doubt it would be of uſe in the cure of the ulcers after the ſloughs were thrown off; but I mean to put that idea ſoon to the teſt, by a courſe of experiments.

Mr C. further remarks, that in applying the vinegar cold, he brought on *tremblings* and *chillneſs*, which he afterwards avoided by warming it, and recommends that in all conſiderable caſes it ſhould be ſo uſed. This obſervation is valuable, as it corroborates that by experience, which is theoretically right, viz. the continuance of the ſtimulus of heat.

heat. The *chillneſs* and *ſhiverings* are here mentioned as being brought on by the application of the *cold* vinegar. What is not a little extraordinary is, that no mention is made by any author whatever (that I know) of the violent ſhiverings, which, in any burn of conſequence, I have univerſally found to be the firſt ſymptom that occurs, and from which, latterly, I have been enabled to form a prognoſis, which, if not always certain, is a great guide to me in practice; for the danger is in proportion to the *violence* of this ſymptom. The remarks reſpecting the general or internal mode of treatment are highly intereſting; he is the firſt author who, in ſuch caſes, has ſhewn the fallacy of what is termed the antiphlogiſtic method of treatment. His idea of purgatives carrying off uſeful, as well as noxious, humours, from the ſyſtem, is certainly very juſt: Great evacuations by the bowels are always *weakening*, as well as diſtreſſing, to patients ſo ſituated. When large opiates are uſed, means to prevent conſtipation are neceſſary; but need not be carried to the effect of purging.

Is it not wonderful that the precepts of *bleeding* and *purging* in all ſuch caſes ſhould for *ages* have been taught in the ſchools, and that an unprejudiced obſerver, as it were with a glance at the ſubject, ſhould in a moment point out the abſurdity of ſuch a treatment!—But let us not be offended at having

ing our errors pointed out by one who is not in the profeſſion: On the contrary, it is worthy ſuch a liberal, nay, I might almoſt add, ſacred profeſſion as ours, truſted as we are with the lives, conſequently with the happineſs, of the community at large, to confeſs our faults, and profit of every opportunity to *reform* them. By ſuch conduct we ſhould atone for our errors, and ſhould give the beſt pledge for the future confidence of the public; which, if we ſo act, we deſerve, and ought to poſſeſs.

It gives me conſiderable ſatisfaction to add the following letter from a medical friend, whoſe attention to, and opportunity in, his profeſſion, enable him to form an adequate judgment of the means recommended: It will alſo have another good tendency, viz. that of inducing other gentlemen of the faculty to have leſs difficulty in adopting the ſame means, when ſupported by further teſtimony than the author's; for, however free from prejudice a man may think himſelf to be, yet an idea ſpringing up and taking root in his mind, produces a greater effect upon him than it can, or perhaps ought to do upon the mind of another:

Dear Sir,

I have tried the *fluor volatile alkali* and the *ol. terebinth.* in a great many caſes of Burns, and have great pleaſure in ſaying, that

that either of them has a better effect than any thing I have hitherto used. When I first commenced practice, the liniment composed of *linseed-oil* and *lime-water* was the application in general use, particularly for the burns of the people employed in the collieries, and was used in such quantities that the miserable patients were kept constantly soaked in it, their beds and bedding were often rotted, and the effluvia arising from it and the discharge of the sores must have been no less noxious to the patients themselves, than intolerable to the surgeon. The greatest objection, however, to it was, that it did not answer the intention; it merely soothed the parts, and procured a temporary relief from pain and smarting, without stopping the progress of inflammation; and it did not tend to promote the suppuration, consequently the healing process was tedious.

Being dissatisfied with this application, I made trial of the *aq. vegeto mineralis*, and found it very useful in abating the violent heat and smarting, which is the immediate effect of fire; but in cases where the skin is much destroyed, and the eschars are deep, it does not seem to be so well adapted. In looking into authors on the subject of burns, I had found various stimulating applications recommended; but never having seen them used, I had not sufficient confidence to try any of them, until you recommended the *fluor volatile alkali* to me, and explained in a very clear and candid manner your ideas on the subject, and at the same time informed me of the result of your practice: I have ever since that period made use of the *fluor volatile alkali*, or *oleum terebinth.* sometimes one, and sometimes the other, and can hardly give a preference to either, both having the same good effects. On the first application, the patient complains of a short increase of heat and smarting, which is immediately succeeded by a pleasing sensation of cold; and continuing to apply it a little longer, the patient becomes quite easy, and in general has no return of heat and smarting; the inflammation is check-

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ed, ſuppuration advances kindly and ſpeedily, and the healing proceſs is readily compleated. In many ſlight caſes no ſuppuration was endured, the cuticle peeling off, and leaving a new one underneath: I uſe *Goulard's cerate* only as a dreſſing in the ſlighter caſes; but when the ſkin is much deſtroyed, and there is likely to be conſiderable eſchars, I employ a ſtimulating ointment, ſuch as the *ungt. reſin. flav.* with *ol. terebinth.* which I always find promotes this ready ſuppuration. I have had no caſe where the injury was ſo extenſive, and the conſequent affection of the ſyſtem ſo conſiderable, as to require the exhibition of ſtimulants internally; but I muſt obſerve that I have not been ſo ſtrict in keeping my patients to the antiphlogiſtic plan as formerly, nor have I had occaſion to give opiates ſo largely as when I purſued a different practice.

With beſt wiſhes for ſucceſs in your endeavours for the improvement of your profeſſion, to which your zeal and induſtry juſtly entitles you,

I remain, dear Sir,

Your's ſincerely,

THOS. LEIGHTON.

*Weſtgate-ſtreet, Newcaſtle,*
*Nov. 6th,* 1796.